Stated Meeting, July 15, 1859.

Present, six members.

Dr. Franklin Bache, in the Chair.

Letters were read, acknowledging the receipt of Nos. 57, 58 of the Proceedings, from the Natural Hist. Society, Northumberland, dated Newcastle, May 5, 1859; the Batavian Society, dated Rotterdam, March 7, 1859; the R. Saxon Society, dated Leipsig, Feb. 14, 1859;—and a letter acknowledging the receipt of Transactions, Vol. II. III. IX. 3, from the Franklin Institute, dated Philadelphia, June 16, 1859.

Letters were read, announcing the transmission of donations for the Library, from the Upper Hessia Society, dated Giessen, March 30, 1859; the Central Phys. Observatory, dated St. Petersburg, Dec. 29, 1859; the Russian Corps of Engineers, dated St. Petersburg, March 1–13, 1859; Elia Lombardini, dated Milan, April 13, 1858, and C. F. Loosey, Austrian Consul at New York, dated July 2, 1859.

A letter was read from Isaac Hazlehurst, Esq., dated Phila. June 22, 1859, resigning his membership in this Society.

The following donations for the Library were announced:—

Proc. Boston N. H. S. VII. 3, 4. Index, &c.—*From the Society.*
Radcliff Obs. XVIII. 1857. Oxford, 1859.—*From the R. Trustees.*
Proc. Amer. Acad. IV. p. 89–248. Boston.—*From the Acad.*
Memoirs Amer. Acad. VI. 2. Boston.—*From the same.*
Am. Journ. Sci. and Arts, July, 1859. N. Haven.—*From the Eds.*
Franklin Institute Journal, July, 1859. Philada.—*From the Inst.*
Amer. J. Med. Sciences, July, 1859. Phila.—*From Blanchard & L.*
Medical News and Lib. July, 1859. Phila.—*From Blanchard & L.*
Proc. Elliott Soc. N. H. I. 1853–'58. Charleston.—*From the Soc.*
African Repository for July, 1859. Wash.—*From A. Col. Society.*
Concord Asylum for Insane. Report, June, 1859.—*From the Trus.*
Proc. R. Geog. Soc. London. Vol. III. No. 2.—*From the Soc.*
Monthly Not. R. Ast. Soc. London. XIX. No. 7.—*From the Soc.*
Trans. Amer. Inst. New York, 1853–'57. Albany. 8vo.—*From the Inst.*
Astrm. Jour. No. 121. Albany. Index to V.—*From Dr. Gould.*

Greenwich A. M. & M. Obs. 1857. London, 1859.—*From the Board of Admiralty.*

Upperhessia S. N. H. and M. 7th Account. Giessen, 1859.—*From the Society.*

En Vandring gjennern Jægerspriis's have og Lund; published by the R. N. Antiq. Soc. Copenhagen, 1858. (40 pp.)—*From the Soc.*

Gelehrte Anzeigen. 46, 47. Münich.—*From the Academy.*

Festival Oration over J. Müller, and his relation to the present Standpoint of Physiology, by Th. L. W. Bischoff. Münich, 1858.—*From the same.*

Oration on the Historical Stages preceding the New Philosophy of Law, by Carl Prantl. München, 1858.—*From the same.*

Contributions I. R. Geog. Soc. 1858. Parts 2, 3. Vienna.—*From the Society.*

Jahrbuch I. R. Geol. Institute, 1858. Parts 1, 2, 3.—*From the Inst.*

Memoirs I. R. Inst. Lombardy. VII. 4, 5, 6. Milan.—*From the Inst.*

Atti I. R. Inst. Lombardy. I. 6, 7, 8, 9, 10.—*From the Inst.*

Compte-rendu Cent. Phys. Obs. 1856. St. Petersburg, 1857.—*From the Ad. Mines.*

Annals of the Observatory. 1855, 1, 2.—*From the same.*

On the French Inundations: a Memoir by E. Lombardini, (in Italian, 110 pp.) Milan, 1858. 4to.—*From the Author.*

On the Changes of the Po, in the district of Ferrara: a Memoir by E. Lombardini. (50 pp.) Milan, 1852. 8vo.—*From the Author.*

On the Importance of Studying the Statistics of Rivers: a Memoir by E. Lombardini. (35 pp.) Milan. 8vo.—*From the Author.*

Other Observations on the Po, by E. L. Milan, 1843.—*From the Author.*

Intorno all sistema idraulico del Po, &c., by E. L. 1840.

Astronomical Notices, No. 7. June 13, 1859. Albany.—*From F. Brünnow.*

Letters from Col. Graham, of Chicago, dated June 20, 1859, were read, accompanying the following communication intended for the Proceedings, and entitled:—

CONTRIBUTIONS TO GEOGRAPHY, No. 3.

On the Latitude and Longitude of eighteen additional positions in the North and North-west of the United States. Also a review of two positions (II. and VI.) *previously reported. From astronomical observations, by Lieut. Colonel J. D. Graham, U. S. Corps of Topographical Engineers.*

Chicago, Illinois, June, 1859.

To the American Philosophical Society, Philadelphia.

I wish now to offer a third contribution to the geography of the United States, for publication in the Proceedings of the Society, if deemed acceptable.

I will indicate the positions by a continuation from the numbers used in the preceding contribution, (No. 2,) published at pp. 352 to 388, of Vol. VI. of the Proceedings. They are as follows, viz:—

VII. ASHTABULA, OHIO.
VIII. ERIE, PENNSYLVANIA.
IX. TOLEDO, OHIO.
X. PRAIRIE DU CHIEN, WISCONSIN.
XI. DUNLEITH, ILLINOIS.
XII. DUBUQUE, IOWA.
XIII. FULTON, ILLINOIS.
XIV. LYONS, IOWA.
XV. ALBANY, ILLINOIS.
XVI. CAMANCHE, IOWA.
XVII. CITY OF ROCK ISLAND, ILLINOIS.
XVIII. FORT ARMSTRONG, ILLINOIS.
XIX. DAVENPORT, IOWA.
XX. NEW BUFFALO, MICHIGAN.
XXI. NILES, MICHIGAN.
XXII. ELYRIA, OHIO.
XXIII. CLEVELAND, OHIO.
XXIV. COLUMBUS, OHIO.

I wish, also, to offer a review, for the purpose of verification, of the following positions previously reported, viz:—

II. MICHIGAN CITY, INDIANA.
VI. MADISON, THE CAPITAL OF WISCONSIN.

The instruments used in making the observations were the same as previously used, and described in page 353 of Vol. VI. of the Society's Proceedings. The system of observation was also the same as was described in the previous papers published in that volume.

The apparent Right Ascensions and Declinations of the stars observed on, were taken from the British Nautical Almanac, except a few whose apparent places are not given in that Ephemeris. The exceptions are as follows, in relation to which the apparent places were taken from the *Connaissance des Temps*, namely:

β Andromedæ
ε Herculis
β Cygni
γ Cygni

For the determination of the longitudes, now reported, two meridians of comparison were used, namely:—I. Chicago. IX. Toledo, Ohio, after its longitude was derived from chronometric comparisons, by means of the electric telegraph, with the meridian of Chicago.

The *time-observations* at Chicago, and the observations both for the *time* and the *latitude* at those stations whose longitudes are based upon direct connections with the meridian of Chicago, will first be given. Then the same will be done in regard to the *time-observations* at Toledo, and the observations at those stations whose longitudes are derived from direct connections with the meridian of Toledo.

Finally, the observations will be given that were made for verifying the positions of Michigan City, Indiana, and Madison, the Capital of Wisconsin.

The position of the observing station at Chicago, will be shown by reference to the table at page 351 of Vol. VI. of the Society's Proceedings.

Observations for the Time at Chicago.

1*st.* 1858, *July* 26*th. At Chicago Observing Station No.* 3, *in latitude* 41° 53′ 46″.3 *N.: longitude* 5*h.* 50*m.* 31*s*.2 *W. of Greenwich.*

Sidereal chronometer No. 2557, fast:

	h.	*m.*	*s.*
By 17 observations on α Coronæ Borealis, west (at 19*h.* 22*m.* sidereal) - - - -	1	02	50.25
By 23 observations on α Andromedæ, east (at 20*h.* 08*m.* sidereal) - - - -	1	02	50.63
Result—Chronometer No. 2557, fast of sidereal time for this station (at 19*h.* 45*m.* sidereal) -	+ 1	02	50.44
By comparison—Chronometer No. 141, was slow of mean solar time for this station (at 11*h.* 26*m.* mean time) - - - -	— 4	38.17	

2d. 1858, *August 4th. At the same Station.*

Sidereal chronometer No. 2557, fast:			
By 8 observations on α Coronæ Borealis, west (at 19*h.* 16*m.*) using horizon roof No. 1, - -	*h. m. s.* 1 03 47.53		
By 9 observations on α Andromedæ, east (at 20*h.* 12*m.*) using, also, horizon roof No. 1, - -	1 03 46.19		
By E. and W. stars (at 19*h.* 44*m.*) with horizon roof No. 1,	+ 1 03 46.86	*h. m. s.*	
		+ 1 03 46.86	
By 8 observations on α Coronæ Borealis, W. (at 19*h.* 30*m.*) using horizon roof No. 2, - -	1 03 46.78		
By 9 observations on α Andromedæ, E. (at 19*h.* 56*m.*) using, also, horizon roof No. 2, - -	1 03 46.57		
By E. and W. stars (at 19*h.* 43*m.*) with horizon roof No. 2, -	1 03 46.68		
		+ 1 03 46.68	
Result--Chronometer No. 2557, fast of sidereal time for this station (at 19*h.* 43*m.* 30*s.*) by 16 observations on α Coronæ Borealis, west; and 18 observations on α Andromedæ, east - -			+ 1 03 46.77
By comparison—Chronometer No. 141, was slow of mean solar time for this station (at 10*h.* 50*m.* mean time) - - - - -			— 4 31.95

3d. 1858, *August 12th. At the same Station. 1st Determination—By East and West Stars.*

Sidereal chronometer No. 2557, fast:	
By 15 observations on α Coronæ Borealis, W. (at 19*h.* 33*m.*) - - - - -	*h. m. s.* 1 04 31.26
By 15 observations on α Andromedæ, E. (at 19*h.* 55*m.*) - - - - -	1 04 31.58

1*st Result. By E. and W. Stars*—Chronometer No. 2557, fast of sidereal time at this station (at 19*h*. 44*m*.) - - - - - + 1 04 31.42

2*d Determination. By equal altitudes of α Cygni, observed East and West. August 12th.*

Observed double altitudes, E and W., corrected for index error of the Sextant.	Times by Sidereal Chronometer No. 2557. Observed East. (*a*)	Observed West. (*b*)	Half sums of times E. and W. $\left(\frac{a+b}{2}\right)$	Apparent A. R., or sidereal time of meridian transit of α Cygni.	Chron. No. 2557, fast of sidereal time at meridian transit of α Cygni, by each pair of equal altitudes.
° ′ ″	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.
111 41 00	18 31 11.8	24 51 07.9	21 41 09.85	20 36 38.43	1 04 31.42
112 30 10	18 33 33	24 48 46.8	,, ,, 09.90	,, ,,	,, ,, 31.47
113 29 35	18 36 25.6	24 45 55.7	,, ,, 10.65	,, ,,	,, ,, 32.22
114 43 55	18 39 59.5	24 42 21.4	,, ,, 10.45	,, ,,	,, ,, 32.02
117 21 10	18 47 30.3	24 34 49.6	,, ,, 09.95	,, ,,	,, ,, 31.52
119 07 45	18 52 34.9	24 29 46.3	,, ,, 10.60	,, ,,	,, ,, 32.17
120 30 10	18 56 31.2	24 25 48	,, ,, 09.60	,, ,,	,, ,, 31.17
121 03 35	18 58 04.6	24 24 14.2	,, ,, 09.40	,, ,,	,, ,, 30.97
121 52 05	19 00 24.4	24 21 56.7	,, ,, 10.55	,, ,,	,, ,, 32.12
123 21 10	19 04 38.4	24 17 41	,, ,, 09.70	,, ,,	,, ,, 31.27
124 00 10	19 06 29.1	24 15 50.2	,, ,, 09.65	,, ,,	,, ,, 31.22
124 52 10	19 08 56.5	24 13 22.5	,, ,, 09.50	,, ,,	,, ,, 31.07
125 22 30	19 10 23.1	24 11 56.5	,, ,, 09.80	,, ,,	,, ,, 31.37
126 08 00	19 12 31.9	24 09 49	,, ,, 10.45	,, ,,	,, ,, 32.02

2*d Result. By* 14 *pairs of equal altitudes of α Cygni*:—Chronometer No. 2557, fast of sidereal time for this station (at 20*h*. 36*m*. 38.43*s*. sidereal time) - - - - - *h*. *m*. *s*. + 1 04 31.57

1*st Result, as above, by E. and W. Stars* (at 19*h*. 44*m*.) - - - - - + 1 04 31.42

Mean, or Result adopted.—Chronometer No. 2557, fast of sidereal time for this station, August 12th, 1858 (at 20*h*. 10*m*. sidereal) - - - + 1 04 31.49

By comparison—Chronometer No. 141, was slow of mean solar time the same night (at 10*h*. 45*m*. mean time) - - - - - — 4 28.31

4th. 1858, *August 15th. At the same Station. 1st Determination—By East and West Stars.*

Sidereal chronometer No. 2557, fast:

	h.	*m.*	*s.*
By 12 observations on α Coronæ Borealis, west (at 19*h.* 04*m.*) -	1	04	48.20
By 21 observations on α Andromedæ, east (at 20*h.* 36*m.*) - -	1	04	48.51

	h.	*m.*	*s.*
1*st Result*—By E. and W. Stars (at 19*h.* 50*m.*)	+ 1	04	48.35

2d Determination—By equal altitudes.

By 9 pairs of equal altitudes of α Cygni, observed East and West (at 20*h.* 36*m.* 38.42*s.*)	+ 1	04	48.36
Mean, or Result adopted—Chronometer No. 2557, fast of sidereal time for this station (at 20*h.* 13*m.* sidereal) this night, - - -	+ 1	04	48.35
By comparison—Chronometer No. 141, was slow of mean solar time this night (at 10*h.* 13*m.* m. t.)	— 4	28.	78.

5th. 1859, *February 20th. At the same Station.*

Sidereal chronometer No. 2557, fast:

1st Set.

	h.	*m.*	*s.*
By 13 observations on β Geminorum, east (at 4*h.* 33*m.*) - -	1	26	04.08
By 13 observations on β Andromedæ, west (at 4*h.* 56*m.*) - -	1	26	03.84

	h.	*m.*	*s.*
1*st Result*—Chronometer No. 2557, fast (at 4*h.* 43*m.*)	+ 1	26	03.96

2d Set.

	h.	*m.*	*s.*
By 14 observations on α Arietis, west (at 6*h.* 05*m.*) - - -	1	26	04.46
By 12 observations on γ Leonis, east (at 6*h.* 29*m.*) - - -	1	26	04.25

2*d Result*—Chronometer No. 2557, fast (at 6*h.* 17*m.*)	+ 1	26	04.35

	h.	m.	s.
Result adopted—Chronometer No. 2557, fast of sidereal time for this station (at 5*h*. 30*m*.)	+ 1	26	04.15
By comparison—Chronometer No. 141, was slow of mean solar time for this station (at 7*h*. 28*m*. mean time)	— 4	41	.29

6*th*. 1859, *February* 23*d*. *At the same Station.*

Sidereal chronometer No. 2557, fast:	h.	m.	s.
By 9 observations on Arcturus, (α Bootis,) east (at 10*h*. 09*m*.)	1	26	20.55
By 5 observations on β Geminorum, west (at 10*h*. 59*m*.)	1	26	20.66
Result—Chronometer No. 2557, fast of sidereal time for this station (at 10*h*. 34*m*.)	1	26	20.60
By comparison—Chronometer No. 141 was slow of mean solar time for this station (at 12*h*. 20*m*. mean time)	— 4	43	.68

This night was not very favorable for observation. It was cloudy, with a few spots of clear sky, within which the only time-stars that were visible were Arcturus and β Geminorum. They do not match very well in Declination,—that of the former being 19° 55′, and that of the latter 28° 22′, both North. As the latitude of the station is well determined, however, there is probably very little error in the deduced *time* from that cause. But there was a very strong wind, which made it difficult to hold the sextant as steady as was desirable for close work. As the *time* deduced affects the accuracy of the longitude of Dunleith, Illinois, herein reported, we will endeavour to verify the result by another series of observations, whenever an opportunity shall occur. We do not apprehend that the error will be found to exceed a fraction of a second of time.

7*th*. 1859, *February* 27*th*. *At the same Station.*

Sidereal chronometer No. 2557, fast:	h.	m.	s.
By 10 observations on α Arietis, west (at 5*h*. 50*m*.)	1	26	45.42
By 13 observations on γ' Leonis, east (at 6*h*. 24*m*.)	1	26	45.74

	h.	m.	s.
Result—Chronometer No. 2557, fast of sidereal time for this station (at 6*h*. 07*m*.) - - -	+ 1	26	45.58
By comparison—Chronometer No. 141 was slow of mean solar time for this station (at 7*h*. 38*m*. mean time) - - - - -	— 4	43.48	

8*th*. 1859, *March* 4*th*. *At the same Station.*

Sidereal chronometer No. 2557, fast:	h.	m.	s.
By 10 observations on β Tauri, west (at 9*h*. 33*m*.)	1	27	15.26
By 12 observations on α Bootis, east (at 10*h*. 07*m*.)	1	27	15.71
Result—Chronometer No. 2557, fast of sidereal time for this station (at 9*h*. 50*m*.) - - -	+ 1	27	15.48
By comparison—Chronometer No. 141, was slow of mean solar time for this station (at 11*h*. 00*m*. mean time) - - - - -	— 4	43.52	

9*th*. 1859, *March* 8*th*. *At the same Station.*

Sidereal chronometer No. 2557, fast:

1*st Set.*

	h.	m.	s.
By 8 observations on α Arietis, west (at 6*h*. 04*m*. 38*s*.) - -	1	27	40.29
By 8 observations on γ' Leonis, east (at 6*h*. 28*m*. 22*s*.) - -	1	27	40.71
1*st Result*—Chronometer No. 2557, fast (at 6*h*. 16*m*. 30*s*.) - - - - -	+ 1	27	40.50
By 6 obs. on α Tauri, west, and 9 obs. on β Tauri, also west, giving weight according to the number on each (at 9*h*. 09*m*.) - -	1	27	41.10
By 16 observations on α Bootis, east (at 10*h*. 25*m*.) - -	1	27	41.56
2*d Result*—Chronometer No. 2557, fast (at 9*h*. 47*m*.)	+ 1	27	41.33

	h.	m.	s.
Result adopted—Chronometer No. 2557, fast of sidereal time for this station (at 8*h*. 02*m*.)	+ 1	27	40.92
By comparison—Chronometer No. 141, was slow of mean solar time for this station (at 8*h*. 57*m*. mean time)	— 4	42.56	

10*th*. 1859, *March* 15*th*. *At the same Station.*

Sidereal chronometer No. 2557, fast:

1*st Set.*

	h.	m.	s.	h.	m.	s.
By 8 observations on γ' Leonis, east (at 6*h*. 32*m*.)	1	28	34.13			
By 6 observations on η Tauri, west (at 7*h*. 00*m*.)	1	28	33.48			
1*st Result*—Chronometer No. 2557, fast (at 6*h*. 46*m*.)				+ 1	28	33.80

2*d Set.*

	h.	m.	s.	h.	m.	s.
By 8 obs. on α Tauri, west, and 7 obs. on β Tauri, also west (at 8*h*. 48*m*.)	1	28	33.88			
By 12 observations on α Bootis, east (at 9*h*. 48*m*.)	1	28	34.51			
2*d Result*—Chronometer No. 2557, fast (at 9*h*. 18*m*.)				+ 1	28	34.20
Result adopted—Chronometer No. 2557, fast (at 8*h*. 02*m*.) giving the 2d result twice the weight of the 1st,				+ 1	28	34.07
By comparison—Chronometer No. 141, was slow of mean solar time for this station (at 8*h*. 30*m*. mean time)				— 4	40.14	

When the stars composing the 1st Set, of this night, were observed, a very strong wind prevailed, which sometimes made it difficult to hold the sextant perfectly steady. When the stars composing the 2d Set were observed, there was but little wind, and the sextant could be held quite steady. For this reason we give the 2d result twice the weight of the 1st. This, however, makes the result adopted only 07 ($\frac{7}{100}$) of a second of time greater than would be obtained by a direct mean of the two results.

11*th.* 1859, *March* 19*th.* *At the same Station.*

Sidereal chronometer No. 2557, fast:	*h.*	*m.*	*s.*
By 7 observations on β Tauri, west (at 9*h.* 17*m.*)	1	29	01.60
By 13 observations on α Bootis, east (at 9*h.* 31*m.*)	1	29	01.66
Result—Chronometer No. 2557, fast of sidereal time for this station (at 9*h.* 24m. sidereal time)	+ 1	29	01.63
By comparison—Chronometer No. 141, was slow of mean solar time for this station (at 9*h.* 35*m.* mean time)	— 4	40.52	

12*th.* 1859, *March* 31*st.* *At the same Station.*

Sidereal chronometer No. 2557, fast:	*h.*	*m.*	*s.*
By 8 observations on β Geminorum, west (at 11*h.* 35*m.*)	1	30	30.08
By 8 observations on α Coronæ Borealis, east (at 11*h.* 53*m.*)	1	30	30.50
Result—Chronometer No. 2557, fast of sidereal time for this station (at 11*h.* 44*m.*)	+ 1	30	30.29
By comparison—Chronometer No. 141 was slow of mean solar time for this station (at 11*h.* 08*m.*)	— 4	38.97	

13*th.* 1859, *April* 3*d.* *At the same Station.*

Sidereal chronometer No. 2557, fast:	*h.*	*m.*	*s.*
By 8 observations on β Geminorum, west (at 11*h.* 11*m.*)	1	30	49.87
By 8 observations on α Coronæ Borealis, east (at 11*h.* 57*m.*)	1	30	49.94
Result—Chronometer No. 2557, fast of sidereal time for this station (at 11*h.* 34*m.*)	+ 1	30	49.90
By comparison—Chronometer No. 141, was slow of mean solar time for this station (at 10*h.* 46*m.* mean time)	— 4	38.70.	

14*th.* 1859, *April* 20*th.* *At the same Station.*

Sidereal chronometer No. 2557, fast:

1*st Set.*

	h.	*m.*	*s.*	*h.*	*m.*	*s.*
By 7 observations on β Tauri, west (at 9*h.* 37*m.*) - - -	1	32	59.29			
By 8 observations on α Bootis, east (at 9*h.* 49*m.*) - - -	1	32	59.64			
1*st Result*—Chronometer No. 2557, fast (at 9*h.* 43*m.*)				+ 1	32	59.46

2*d Set.*

By 8 observations on β Geminorum, west (at 11*h.* 20*m.*) - -	1	33	00.04			
By 9 observations on α Coronæ Borealis, east (at 11*h.* 52*m.*)	1	32	59.84			
2*d Result*—Chronometer No. 2557, fast (at 11*h.* 36*m.*) - - - -				+ 1	32	59.94
Result adopted—Chronometer No. 2557, fast of sidereal time for this station (at 10*h.* 40*m.*)				+ 1	32	59.70
By comparison—Chronometer No. 141 was slow of mean solar time for this station (at 8*h.* 45m.)				— 4	41	06

15*th.* 1859, *April* 27*th.* *At the same Station.*

Sidereal chronometer No. 2557, fast:

	h.	*m.*	*s.*	*h.*	*m.*	*s.*
By 10 observations on ε Bootis, east (at 10*h.* 53*m.*) - -	1	33	52.18			
By 10 observations on α Coronæ Borealis, also east (at 11*h.* 43*m.*)	1	33	52.05			
By 20 observations on 2 East stars (at 11*h.* 18*m.*) - -	1	33	52.11	+ 1	33	52.11
By 10 observations on β Geminorum, west (at 11*h.* 24*m.*) - - - -				+ 1	33	51.84
Result—Chronometer No. 2557, fast of sidereal time for this station (at 11*h.* 21*m.*) - -				+ 1	33	51.97

By comparison—Chronometer No. 141 was slow of mean solar time for this station (at 9*h*. 00*m*. mean time) . . . . — 4 41.14

16*th*. 1859, *April* 29*th*. *At the same Station.*

Sidereal chronometer No. 2557, fast:

	h. *m*. *s*.	*h*. *m*. *s*.
By 9 observations on ε Bootis, east (at 11*h*. 00*m*.) - -	1 34 05.38	
By 15 observations on α Coronæ Borealis, also east (at 11*h*. 48*m*.)	1 34 05.41	
By 24 observations on 2 East stars (at 11*h*. 24*m*.) - -	1 34 05.40	
		+ 1 34 05.40
By 17 observations on β Geminorum, west (at 11*h*. 24*m*.) - . - -		+ 1 34 05.24
Result—Chronometer No. 2557, fast of sidereal time for this station (at 11*h*. 24*m*.) -		+ 1 34 05.32
By comparison—Chronometer No. 141, was slow of mean solar time for this station (at 8*h*. 54*m*. mean time) - - - - -		— 4 41.48

17*th*. 1859, *May* 16*th*. *At the same Station.*

Sidereal chronometer No. 2557, fast:

	h. *m*. *s*.
By 11 observations on β Geminorum, west (at 11*h*. 41*m*.) - - - - -	1 36 14.61
By 9 observations on α Coronæ Borealis, east (at 12*h*. 00*m*.) - - - . -	1 36 15.19
Result—Chronometer No. 2557, fast of sidereal time for this station (at 11*h*. 50*m*.) -	+ 1 36 14.90
By comparison—Chronometer No. 141, was slow of mean solar time for this station (at 8*h*. 13*m*. mean time) - - - - -	— 4 41.43

18*th.* 1859, *May* 19*th.* *At the same Station.*

Sidereal chronometer No. 2557, fast:

1st Set.

	h.	m.	s.	
By 12 observations on α Coronæ Borealis, east (at 12*h.* 26*m.*) -	1	36	37.93	
By 12 observations on ε Leonis, west (at 12*h.* 44*m.*) - -	1	36	37.12	
1*st Result*—Chronometer No. 2557, fast (at 12*h.* 35*m.*) - - - - -				+ 1 36 37.52

2d Set.

	h.	m.	s.	
By 9 observations on γ' Leonis, west (at 13*h.* 07*m.*) - -	1	36	37.31	
By 12 observations on ζ Herculis, east (at 13*h.* 30*m.*) - -	1	36	37.87	
2*d Result*—Chronometer No. 2557, fast (at 13*h.* 19*m.*) - - - - .				+ 1 36 37.59

3d Set.

	h.	m.	s.	
By 5 observations on α Ophiuchi, east (at 13*h.* 42*m.*) - -	1	36	37.48	
By 6 observations on α Leonis, west (at 13*h.* 54*m.*) - -	1	36	37.60	
3*d Result*—Chronometer No. 2557, fast (at 13*h.* 48*m.*) - - - - -				+ 1 36 37.52
Result adopted, or mean of the 3 sets—Chronometer No. 2557, fast of sidereal time for this station (at 13*h.* 14*m.*) - - -				+ 1 36 37.55
By comparison—Chronometer No. 141, was slow of mean solar time for this station (at 9*h.* 25*m.* mean time) - - - - - -				— 4 40.16

19*th.* 1859, *May* 21*st.* *At the same Station.*

Sidereal chronometer No. 2557, fast:

1st Set.

	h. m. s.	h. m. s.
By 9 observations on α Coronæ Borealis, east (at 12*h*. 18*m*.) -	1 36 51.65	
By 10 observations on ε Leonis, west (at 12*h*. 40*m*.) - -	1 36 50.96	
1*st Result*—Chronometer No. 2557, fast (at 12*h*. 29*m*.) - - - -		+ 1 36 51.31

2d Set.

By 8 observations on β Geminorum, west (at 12*h*. 04*m*.) - -	1 36 50.75	
By 8 observations on ζ Herculis, east (at 12*h*. 34*m*.) - -	1 36 51.58	
2*d Result*—Chronometer No. 2557, fast (at 12*h*. 19*m*.) - - - -		+ 1 36 51.16
Result adopted—Chronometer No. 2557, fast of sidereal time for this station (at 12*h*. 34*m*.)		+ 1 36 51.24
By comparison—Chronometer No. 141, was slow of mean solar time for this station (at 8*h*. 27*m*. mean time) - - - - -		— 4 41.08

20th. 1859, May 22d. At the same Station.

Sidereal chronometer No. 2557, fast:

	h. m. s.	h. m. s.
By 10 observations on α Coronæ Borealis, east (at 12*h*. 14½*m*.) -	1 36 58.55	
By 4 observations on ε Herculis, also east (at 12*h*. 57*m*.) - -	1 36 58.59	
By 14 observations on 2 East Stars, giving weight according to the number on each, (at 12*h*. 36*m*.)	1 36 58.56	+ 1 36 58.56
By 11 observations on ε Leonis, west (at 12*h*. 44*m*.)		+ 1 36 58.15
Result—Chronometer No. 2557, fast of sidereal time for this station (at 12*h*. 40*m*.) -		+ 1 36 58.35

By comparison—Chronometer No. 141, was slow of mean solar time for this station (at 8*h*. 39*m*. mean time) - - - - - — 4 41 65

21*st*. 1859, *May* 24*th*. *At the same Station.*

Sidereal chronometer No. 2557, fast:

	h. *m*. *s*.
By 11 observations on α Coronæ Borealis, east (at 12*h*. 22*m*.) - - - - -	1 37 13.25
By 11 observations on ε Leonis, west (at 12*h*. 38*m*.)	1 37 12.75
Result—Chronometer No. 2557, fast of sidereal time for this station (at 12*h*. 30*m*.) - -	+ 1 37 13.00

By comparison—Chronometer No. 141, was slow of mean solar time (at 8*h*. 21*m*. mean time) - — 4 41.60

22*d*. 1859, *June* 3*d*. *At the same Station.*

Sidereal chronometer No. 2557, fast:

1st Set.

	h. *m*. *s*.	
By 7 observations on δ Leonis, west (at 15*h*. 04*m*.) - - -	1 38 33.25	
By 8 observations on ξ Cygni, east (at 15*h*. 24*m*.) - -	1 38 33.60	
1st Result—Chronometer No. 2557, fast (at 15*h*. 14*m*.) - -	1 38 33.42	
		+ 1 38 33.42

2d Set.

By 10 observations on α Lyræ, east (at 15*h*. 40*m*.) - -	1 38 33.00	
By 10 observations on α, or 12, Canum Venaticor. west (at 16*h*. 00*m*.) - - -	1 38 33.18	
2d Result—Chronometer No. 2557, fast (at 15*h*. 50*m*.) - -	1 38 33.09	
		+ 1 38 33.09

	h. m. s.
Result adopted—Chronometer No. 2557, fast of sidereal time for this station (at 15*h*. 37*m*.)	+ 1 38 33.26
By comparison—Chronometer No. 141, was slow of mean solar time for this station (at 10*h*. 48*m*. mean time) - - - - -	— 4 44.22

23*d*. 1859, *June 6th*. *At the same Station.*

Sidereal chronometer No. 2557, fast:

1*st Set.*

	h. m. s.	h. m. s.
By 9 observations on γ' Leonis, west (at 14*h*. 19*m*.) - -	1 38 51.20	
By 12 observations on β Cygni, east (at 14*h*. 57*m*.) - -	1 38 51.26	
1*st Result*—Chronometer No. 2557, fast (at 14*h*. 38*m*.) - -	1 38 51.23	+ 1 38 51.23

2*d Set.*

	h. m. s.	h. m. s.
By 11 observations on δ Leonis, west (at 14*h*. 04*m*.) - -	1 38 51.20	
By 18 other observations at a later period of the night, on β Cygni, east (at 16*h*. 16*m*.) - -	1 38 51.52	
2*d Result*—Chronometer No. 2557, fast (at 15*h*. 10*m*.) - -	1 38 51.36	+ 1 38 51.36

3*d Set.*

	h. m. s.	h. m. s.
By 13 observations on α Lyræ, east (at 15*h*. 18*m*.) - -	1 38 51.82	
By 15 observations on α (or 12) Canum Venaticorum, west (at 16*h*. 12m. - - -	1 38 51.50	
3*d Result*—Chronometer No. 2557, fast (at 15*h*. 45*m*.) - -	1 38 51.66	+ 1 38 51.66

	h.	m.	s.
Result adopted—Chronometer No. 2557, fast of sidereal time for this station (at 15*h*. 11*m*.)	+ 1	38	51.42
By comparison—Chronometer No. 141, was slow of mean solar time for this station (at 10*h*. 11*m*. mean time)	— 4	44.80	

24*th*. 1859, *June* 10*th*. *At the same Station.*

Sidereal chronometer No. 2557, fast:

1st Set.

	h.	m.	s.	h.	m.	s.
By 14 observations on γ' Leonis, west (at 14*h*. 28*m*.)	1	39	17.98			
By 13 observations on β Cygni, east (at 14*h*. 52*m*.)	1	39	17.98			
1*st Result*—Chronometer No. 2557, fast, (at 14*h*. 40*m*.)	1	39	17.98	+ 1	39	17.98

2d. Set.

	h.	m.	s.	h.	m.	s.
By 12 observations on α Lyræ, east (at 15*h*. 37*m*.)	1	39	18.46			
By 14 observations on α (or 12) Canum Venaticorum, west (at 16*h*. 05*m*.)	1	39	18.28			
2*d Result*—Chronometer No. 2557, fast (at 15*h*. 51*m*.)	1	39	18.37	+ 1	39	18.37

3d Set.

	h.	m.	s.	h.	m.	s.
By 24 observations on γ Cygni, east (at 16*h*. 55*m*.)	1	39	18.62			
By 15 observations on ε Bootis, west (at 17*h*. 21*m*.)	1	39	18.40			
3*d Result*—Chronometer No. 2557, fast (at 17*h*. 08*m*.)	1	39	18.51	+ 1	39	18.51

	h.	m.	s.
Result adopted—Chronometer No. 2557, fast of sidereal time for this station (at 15*h*. 53*m*.)	+ 1	39	18.29
By comparison—Chronometer No. 141, was slow of mean solar time for this station (at 10*h*. 37*m*. mean time) - - - - -	— 4	46.59	

25*th*. 1859, *June* 22*d*. *At the same Station.*

Sidereal chronometer No. 2557, fast:

1st Set.

	h.	m.	s.	h.	m.	s.
By 10 observations on δ Leonis, west (at 15*h*. 16*m*.) - -	1	40	48.05			
By 10 observations on β Cygni, east (at 15*h*. 29*m*.) - -	1	40	47.96			
1*st Result*—Chronometer No. 2557, fast (at 15*h*. 22*m*.) - -	1	40	48.00	+ 1	40	48.00

2d Set.

	h.	m.	s.	h.	m.	s.
By 9 observations on α (or 12) Canum Venaticorum, west (at 15*h*. 40*m*.)	1	40	47.63			
By 11 observations on α Lyræ, east (at 15*h*. 56*m*.) - -	1	40	48.05			
2*d Result*—Chronometer No. 2557, fast (at 15*h*. 48*m*.) - -	1	40	47.84	+ 1	40	47.84

3d Set.

	h.	m.	s.	h.	m.	s.
By 12 other observations on β Cygni, east (at 16*h*. 23*m*.) - -	1	40	48.06			
By 17 observations on ϵ Bootis, west (at 17*h*. 41*m*.) - -	1	40	48.31			
3*d Result*—Chronometer No. 2557, fast (at 17*h*. 02*m*.) - -	1	40	48.18			
				+ 1	40	48.18
Result adopted—Chronometer No. 2557, fast of sidereal time for this station (at 16*h*. 04*m*.)				+ 1	40	48.00

By comparison—Chronometer No. 141, was slow of mean solar time for this station (at 10*h*. 02*m*. mean time) - - - - - — 4 49.83

26*th*. 1859, *June* 24*th*. *At the same Station.*

Sidereal chronometer No. 2557, fast:

1*st Set.*

	h. *m*. *s*.	*h*. *m*. *s*.
By 12 observations on α Lyræ, east (at 15*h*. 25*m*.) - - -	1 41 02.05	
By 12 observations on α Canum Venaticorum, west (at 16*h*. 02*m*.)	1 41 01.82	
1*st Result*—Chronometer No. 2557, fast (at 15*h*. 42*m*.) - -	1 41 01.94	+ 1 41 01.94

2*d Set.*

By 9 observations on δ Leonis, west (at 15*h*. 11*m*.) - -	1 41 01.74	
By 9 observations on ζ Cygni, east (at 16*h*. 46*m*.) - - -	1 41 02.16	
2*d Result*—Chronometer No. 2557, fast (at 15*h*. 58*m*.) - -	1 41 01.95	+ 1 41 01.95

3*d Set.*

By 9 observations on β Cygni, east (at 15*h*. 46*m*.) - - -	1 41 02.33	
By 11 observations on ϵ Bootis, west (at 18*h*. 18*m*.) - - -	1 41 02.52	
3*d Result*—Chronometer No. 2557, fast (at 17*h*. 02*m*.) - -	1 41 02.42	+ 1 41 02.42

Result adopted—Chronometer No. 2557, fast of sidereal time for this station (at 16*h*. 14*m*.) + 1 41 02.10

By comparison—Chronometer No. 141, was slow of mean solar time for this station (at 10*h*. 03*m*. mean time) - - - - - — 4 50.21

27th. (*Omitted in the proper order of dates.*) 1858, *March 22d. At Chicago Observing Station, No.* 1, *in lat.* 41° 53′ 50″.3 *N.: long.* 5*h.* 50*m.* 30.99*s. west of the meridian of Greenwich.* See page 351 of Vol. VI. of the Society's Proceedings.

Mean solar chronometer No. 141, slow of mean time, at apparent noon:

	m.	*s.*
By 5 pairs of equal altitudes of the sun's upper and lower limbs - - - - -	— 4	56.26
By comparison.—Sidereal chronometer No. 2557, fast of sidereal time for this station, at apparent noon, (say at 0*h.* 06*m.* 44*s.* sidereal time) -	+ 49	55.67

I desired to get observations on East and West Stars for the *time* on the night of March 22d; but the sky was entirely clouded, which prevented it. On the next morning (March 23) I started with both chronometers, the sextant and artificial horizon, on a journey to Fulton and Albany, Illinois. I also visited Lyons, in Iowa. Having observed for the latitude and longitude of these places—depending for the longitude on the run of the two chronometers—I returned to Chicago on the evening of March 29th, 1858, and made the following observations for the *time*, viz:—

28th. 1858, *March 29th. At Chicago Observing Station No.* 1.

Sidereal chronometer No. 2557, fast:

	m.	*s.*	*m.*	*s.*
By 7 observations on α Tauri, west (at 8*h.* 48*m.*) - - - -	50	26.94		
By 11 observations on β Tauri, also west (at 9*h.* 21*m.*) - - -	50	27.14		
By 18 observations on 2 West Stars (at 9*h.* 08*m.*) giving weight according to the number of observations on each -	50	27.06	+ 50	27.06
By 20 observations on α Bootis, east (at 10*h.* 20*m.*) - - - -			+ 50	26.90
Result—Chronometer No. 2557, fast of sidereal time for this station (at 9*h.* 44*m.*) sidereal time			+ 50	26.98

	h.	m.	s.
By comparison—Chronometer No. 141 was slow of mean solar time for this station (at 9*h*. 15*m*. mean time) - - - - - - -	— 5	01	76

P. S. The following determinations of the Chicago time (Nos. 29 and 30) were made after this paper was presented, with reference to a second determination of the longitude of the City of Rock Island, viz:—

29*th*. 1859, *July* 28*th*. *At Chicago Station No.* 3.

Sidereal chronometer No. 2557, fast:	h.	m.	s.
By 13 observations on ε Bootis, west (at 17*h*. 44*m*.)	+ 1	45	30.94
By 15 observations on ζ Cygni, east (at 18*h*. 06*m*.)	+ 1	45	31.40
Result—Chronometer No. 2557, fast of sidereal time for this station (at 17*h*. 55*m*.) -	+ 1	45	31.17
By comparison—Chronometer No. 141, was slow of mean solar time for this station (at 9*h*. 30*m*. mean time) - - - - - -	— 5	03	37

30*th*. 1859, *July* 31*st*. *At the same Station.*

Sidereal chronometer No. 2557, fast:	h.	m.	s.
By 10 observations on ζ Cygni, east (at 17*h*. 45*m*.)	+ 1	45	53.86
By 10 observations on ε Bootis, west (at 18*h*. 01*m*.)	+ 1	45	54.13
Result—Chronometer No. 2557, fast of sidereal time for this station (at 17*h*. 53*m*.) -	+ 1	45	53.99
By comparison—Chronometer No. 141, was slow of mean solar time for this station (at 9*h*. 16*m*. mean time) - - - - -	— 5	05	63

This ends the series of time-observations made at Chicago during the period included in this paper.

Rates of the Chronometers.

The rates of the chronometers during the period included in this paper, were as follows, viz:

1st. Rates of Sidereal Chronometer No. 2557.

FROM	TO	Elapsed Sidereal interval.	Rate per 24 Sidereal Hours.
		Days and Decimals.	+ Gaining.
1858.	1858.		*s.*
March 22,	March 29,	7.401	4 230
March 29,	June 19,	82.256	6 377
June 19,	June 20,*	1.002	7.075
July 21,	July 26,	5.117	6.369
July 26,	August 4,	8.999	6.260
August 4,	August 12,	8.018	5.580
August 12,	August 15,	3 002	5.620
August 15,	August 23,	7.991	6.110
August 23,	September 5,	12.990	5.930
September 5,	September 7,	2 079	6.000
September 7,	September 18, 1859.	10.931	5.538
September 18, 1859.	January 17,	121.354	7.048
January 17,	January 27,	10 146	5.220
January 27,	January 28,	0.835	5.230
January 28,	February 20,	23.071	7.140
February 20,	February 23,	3.211	5 120
February 23,	February 27,	3.815	6.550
February 27,	March 4,	5 155	5 800
March 4,	March 8,	3.925	6.480
March 8,	March 15,	7 000	7.590
March 15,	March 19,	4.057	6.793
March 19,	March 31,	12 097	7.330
March 31,	April 3,	2.993	6.550
April 3,	April 20,	16.963	7.650
April 20,	April 27,	7.028	7.430
April 27,	April 29,	2.002	6.669
April 29,	May 16,	17.018	7.610
May 16,	May 19,	3.057	7.366
May 19,	May 21,	1.965	6.966
May 21,	May 22,	1.011	7.033
May 22,	May 24,	1.993	7.351
May 24,	June 3,	10.130	7.923
June 3,	June 6,	2.982	6.086
June 6,	June 10,	4 029	6 669
June 10,	June 22,	12.007	7.470
June 22,	June 24,	2.007	7.025
June 24,	July 28,	34.070	7 897
July 28,	July 31,	2.999	7 610

*The rates from June 20, to July 21, 1858, are given at page 362 of Vol. VI. of the Society's Proceedings.

The above table shows clearly that the rate of sidereal chronometer, No. 2557, was accelerated when it was allowed to remain at rest, and that it was retarded (the rate of gaining diminished) by the effect of travelling, independent of the effect of change of temperature.

2d. Rates of Mean Solar Chronometer No. 141.

FROM	TO	Elapsed Mean Solar interval.	Rate per 24 Mean Solar Hours.
		Days and Decimals.	+Gaining. —Losing.
1858.	1858.		*s.*
March 22,	March 29,	7.385	— 0.744
March 29,	June 19,	82 031	+ 0.042
June 19,	June 20,*	1.000	— 0.760
July 21,	July 26,	5.103	+ 0.701
July 26,	August 4.	8.986	+ 0.690
August 4,	August 12,	7.994	+ 0.455
August 12,	August 15,	2.978	— 0.187
August 15,	August 23,	7.985	+ 0.145
August 23,	September 5.	12.954	— 0.068
September 5,	September 7,	2.064	+ 0.070
September 7,	September 18,	10.900	+ 0.020
	1859.		
September 18,	January 17,	121.023	+ 0.015
1859.			
January 17,	January 27,	10.119	— 1.160
January 27,	January 28,	0.832	— 1.295
January 28,	February 20,	23.007	— 0.096
February 20,	February 23,	3.203	— 0.746
February 23,	February 27,	3.804	+ 0.052
February 27,	March 4,	5.140	— 0.008
March 4,	March 8,	3.915	+ 0.245
March 8,	March 15,	6.992	+ 0.346
March 15,	March 19,	4.045	— 0.094
March 19,	March 31,	12.065	+ 0.128
March 31,	April 3,	2 985	+ 0.090
April 3,	April 20,	16.916	— 0.140
April 20,	April 27,	7.011	— 0.011
April 27,	April 29,	1.996	— 0.170
April 29,	May 16,	16.971	+ 0.003
May 16,	May 19,	3.006	+ 0.377
May 19,	May 21,	1.959	— 0.470
May 21,	May 22,	1.008	— 0.565
May 22,	May 24,	1.988	+ 0.027
May 24,	June 3,	10.102	— 0 259
June 3,	June 6,	2.971	— 0.200
June 6,	June 10,	4.018	— 0 443
June 10,	June 22,	11.976	— 0.270
June 22,	June 24,	2.000	— 0.190
June 24,	July 28,	33.977	— 0.387
July 28,	July 31,	2.990	— 0.755

*See preceding foot note.

We will now give the observations that were made at the station whose positions were to be determined, following the order in which they are enumerated in the beginning of this paper.

VII. ASHTABULA, OHIO.

Station—The centre of the Public Square.

1*st. Observations for the Latitude* (*Approximate*) 1858, *Aug. 6th.*

The sky to the north was cloudy, and that to the south was still more so, which prevented observations, as satisfactory as could be wished, for the latitude. It was, however, obtained near enough for computing the observations on East and West Stars for the *time* and *longitude*, as follows, viz:—

By 14 circum-meridian altitudes on γ Cephei north, combined with 2 observations (circum-meridian) on Altair (α Aquilæ,) and 4 on γ Pegasi, both south;—latitude - - - 41° 52′ 04″ N.

2*d. Observations for the Time.*

Sidereal chronometer No. 2557, fast:

1*st Set. Before the Telegraph Signals.*

	m.	*s.*		
By 5 observations on α Coronæ Borealis, west (at 20*h.* 02*m.*) -	36	34.55		
By 12 observations on α Andromedæ, east (at 20*h.* 28*m.*) - -	36	34.00		
1*st Result. Before the signals*—Chronometer No. 2557, fast (at 20*h.* 15*m.*)	36	34.27	*m.*	*s.*
			+ 36	34.27

2*d Set. After the Signals.*

By 8 observations on α Cygni, west (at 24*h.* 29*m.*) - -	36	34.58		
By 11 observations on α Aurigæ (Capella) east (at 25*h.* 19*m.* or 1*h.* 19*m.* of Aug. 7th, sidereal)	36	35.11		
2*d Result. After the Signals*—Chronometer No. 2557, fast (at 0*h.* 54*m.* of Aug. 7th, sidereal) -	36	34.85		
			+ 36	34.85

Result adopted—Chronometer No. 2557, fast of sidereal time for this station (at 22*h*. 34*m*. of Aug. 6th, sidereal) - - - - + 0 34.56

3*d*. *For the Longitude.*

The above result, for the Ashtabula time, compared with the time-observations at Chicago, of the 4th and 12th of August, to obtain the rate of mean solar chronometer No. 141, and applied to the following telegraphic signals, gives the difference of longitude between those two places, and the longitude of Ashtabula west of the meridian of Greenwich, as follows, viz:—

The rate of the sidereal chronometer, from the period of its determination this night, back to the period of each signal, is deduced, in this instance, from the two sets of *time-observations* made this night. The great elapsed time here, being 4*h*. 39*m*., seemed to justify this.

Determination of the difference of Longitude between Chicago and Ashtabula, Ohio, by electric signals for comparisons of time, August 6th, 1858.

Sidereal Chronometer No. 2557, fast, of Ashtabula, sidereal time, (at 21*h*. 18*m*. sidereal time,) 36*m*. 34.04*s*.

Rate per sidereal day, + 3*s*.00; or per sidereal hour, + 0*s*.125.

Mean Solar Chronometer No. 141, slow, of Chicago, mean solar time, (at 11*h*. 49*m*. mean time,) 4*m*. 31*s*.02.

Rate per mean solar day, + 0*s*.455; or per mean solar hour, + 0*s*.01896.

1st.—Chicago signals recorded at both stations.

Times of Signals given at Chicago by mean solar Chronometer No. 141.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals as noted at Ashtabula by sidereal Chronometer No. 2557.	Ashtabula correct sidereal time of Chicago signals.	Chicago reduced sidereal time of Chicago signals.	Difference of Longitude by each signal. Ashtabula, east of the meridian of Chicago observing-station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
11 44 40	11 49 01.02	21 54 56.5	21 18 22.10	20 51 00.72	0 27 21.38
11 47 10	11 51 41.02	21 57 27	21 20 52.59	20 53 31.13	0 27 21.46
12 11 30	12 16 01.01	22 21 51	21 45 16.54	21 17 55 12	0 27 21.42
12 14 30	12 19 01.01	22 24 51.5	21 48 17.04	21 20 55.61	0 27 21.43

1st Mean.—Electric signals sent from Chicago to Ashtabula 0 27 21.422

2d.—Ashtabula signals recorded at both stations.

Times of signals given at Ashtabula by sidereal Chronometer No. 2557.	Times of Ashtabula signals as noted at Chicago by mean solar Chronometer No. 141.	Chicago correct mean solar time of Ashtabula signals.	Chicago reduced sidereal time of Ashtabula signals.	Ashtabula correct sidereal time of Ashtabula signals.	Difference of Longitude by each signal.—Ashtabula East of the meridian of Chicago observing station, No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
22 09 49	11 59 30	12 04 01.02	21 05 53.16	21 33 14.57	0 27 21.41
22 12 49.5	12 02 30	12 07 01.02	21 08 53.65	21 36 15.06	0 27 21.41
22 15 50	12 05 30	12 10 01.01	21 11 54.13	21 39 15.56	0 27 21.43
22 18 50.5	12 08 30	12 13 01.01	21 14 54.62	21 42 16.05	0 27 21.43

2d Mean.—Electric signals sent from Ashtabula to Chicago, 0 27 21.42

1st Mean.—Electric signals sent from Chicago to Ashtabula, as above, - - - - - - - 0 27 21.422

Result:—Centre of the Public Square at Ashtabula, east, in longitude of Chicago observing Station No. 3, by a mean of the two sets of signals, - - - - — 0 27 21.42

Longitude of Chicago observing station No. 3, west of the meridian of Greenwich, - + 5 50 31.20

Longitude of the centre of the Ashtabula Public Square, west of the meridian of Greenwich, - 5 23 09.78

Equal, in arc, to - - - - 80° 47′ 26″.7 W.

Latitude (approximate) as before, - - 41° 52′ 04″ N.

VIII. ERIE, PENNSYLVANIA.

Station.—The point of intersection of the two diagonal lines of the lumber-lot of Mr. William Sandborn, fronting on Sixth street, between Holland and French streets.

1*st. Observations for the Latitude.* 1858, *August 8th.*

	°	′	″
By 16 observations on Polaris, north, combined with 16 observations (circum-meridian) on α Aquarii, south, - - - - -	42	07	53.8
Same night—By 28 circum-meridian altitudes of Altair (α Aquilæ,) south, combined with 22 circum-meridian altitudes of γ Cephei, north, -	42	07	55.8
Result—Latitude of station, - - -	42	07	54.8 N.

2d. *Observations for the Time. August 8th*, 1858.

	m.	s.
Sidereal chronometer No. 2557, fast:		
By 9 observations on α Coronæ Borealis, west (at 19*h*. 06*m*.) - - - - -	33	56.51
By 8 observations on α Andromedæ, east (at 20*h*. 24*m*.) - - - - -	33	57.29
Result—Chronometer No. 2557, fast of sidereal time for this station (at 19*h*. 45*m*.) - -	+ 33	56.90

August 9th, 1858. Sidereal chronometer No. 2557, fast:

1*st Set.*

	m.	s.	m.	s.
By 13 observations on α Coronæ Borealis, west (at 19*h*. 25*m*.)	34	02.58		
By 12 observations on α Andromedæ, east (at 20*h*. 03*m*.) - -	34	02.45		
1*st Result*—Chronometer No. 2557, fast (at 19*h*. 44*m*.) - -	34	02.51	+ 34	02.51

2*d Set.*

By 12 pairs of equal altitudes of α Cygni, observed east and west (at 20*h*. 86*m*. 38.44*s*. or meridian transit) - - - - -			+ 34	02.73
Result adopted—Chronometer No. 2557, fast of sidereal time for this station (at 20*h*. 10*m*.)			+ 34	02 62

3d. *The Longitude.*

In obtaining the difference of longitude between Erie and Chicago, we use the time by sidereal chronometer No. 2557, for the meridian of Erie as derived from the foregoing observations of August 9th. The rate of that chronometer, carried forward from the period of the determination of the said time to that of the signals, is derived from the observations made at Erie on the nights of August 8th and 9th.

The corresponding time for the meridian of Chicago, is derived from the observations made there on the 4th and 12th of August, which give the rate of the mean solar chronometer No. 141, during that interval, and also the means of reducing the Chicago time to the period of the said signals.

The signals and the results derived from them were as follows, viz.—

Determination of the difference of Longitude between Chicago and Erie, Pennsylvania, by electric signals for comparisons of time, August 9th, 1858.

Sidereal Chronometer No. 2557, fast, of Erie, sidereal time, (at 20*h*. 59*m*.. sidereal time,) 34*m*. 02*s*.81.

Rate per sidereal day, + 5*s*.62; or per sidereal hour, + 0*s*.234.

Mean solar Chronometer No. 141, slow, of Chicago, mean solar time, (at 11*h*. 15*m*. mean time,) 4*m*. 29*s*.67.

Rate per mean solar day, + 0*s*.455; or per mean solar hour, + 0*s*.01896.

1st.—Chicago signals recorded at both stations.

Times of signals given at Chicago, by mean solar Chronometer No. 141.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals, as noted at Erie, by sidereal Chronometer No. 2557.	Erie correct sidereal time of Chicago signals.	Chicago reduced sidereal time of Chicago signals.	Difference of Longitude by each signal.—Erie east of the meridian of Chicago observing station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
11 11 00	11 15 29.67	21 33 16	20 59 13.19	20 29 03.50	0 30 09.69
11 13 50	11 18 19.67	21 36 06.5	21 02 03.68	20 31 53.97	0 30 09.71
11 16 50	11 21 19.67	21 39 07	21 05 04.17	20 34 54.46	0 30 09.71
11 19 50	11 24 19.67	21 42 07.5	21 08 04.66	20 37 54.85	0 30 09.71
11 22 30	11 26 59.67	21 44 48	21 10 45.15	20 40 35.40	0 30 09.75
11 43 39	11 48 08.66	22 06 00.5	21 31 57.56	21 01 47.86	0 30 09.70
11 46 39	11 51 08.66	22 09 01	21 34 58.05	21 04 48.35	0 30 09.70
11 49 42	11 54 11.66	22 12 04.5	21 38 01.54	21 07 51.85	0 30 09.69

1st Mean.—Electric signals sent from Chicago to Erie, - 0 30 09.708

2d.—Erie signals recorded at both stations.

Times of signals given at Erie by sidereal Chronometer No. 2557.	Times of Erie signals as noted at Chicago by mean solar Chronometer No. 141.	Chicago correct mean solar time of Erie signals.	Chicago reduced sidereal time of Erie signals.	Erie correct sidereal time of Erie signals.	Difference of Longitude by each signal.—Erie east of the meridian of Chicago observing station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
21 50 58	11 28 39	11 33 08.66	20 46 35.39	21 16 55.12	0 30 09.73
21 53 58.5	11 31 39	11 36 08.66	20 49 45.89	21 19 55.61	0 30 09.72
21 56 59	11 34 39	11 39 08.66	20 52 46.38	21 22 56.10	0 30 09.72
21 59 59.5	11 37 39	11 42 08.66	20 55 46.87	21 25 56.59	0 30 09.72
22 03 00	11 40 39	11 45 08.66	20 58 47.36	21 28 57.08	0 30 09.72

2d Mean.—Electric signals sent from Erie to Chicago, - - 30 09.722

1st Mean.—Electric signals sent from Chicago to Erie as above, 30 09.708

Result:—Erie Observing Station is east, in longitude, of Chicago Observing Station No. 3, by a mean of the two sets of signals, - - - - - - - — 30 09.715

	h. m. s.
Brought forward,	— 0 30 09.715
Longitude of Chicago observing station No. 3, west of the meridian of Greenwich, -	+ 5 50 31.2
Longitude of Erie observing station west of the meridian of Greenwich, - - -	+ 5 20 21.5
Equal, in arc, to - - - -	80° 05′ 22″.5 W.
Latitude, as before, - - -	42° 07′ 54″.8 N.

My duties required me to return to Chicago immediately after completing the above observations. I arrived there on the morning of the 11th August. The night of that date was unfavourable for observations, which had to be deferred until the night of the 12th. This makes the elapsed time between the Chicago observations, which enter into the above determination of the longitudes of Ashtabula and Erie, from the 4th to the 12th of August; or 8 solar days, during which period we depend on the run of mean solar chronometer No. 141, in deducing those longitudes.

IX. TOLEDO, OHIO.

Station.—By a *true* azimuth derived from observations on Polaris (α Ursæ Minoris) with the theodolite, and a horizontal measurement with the chain, from this observing station to the point of intersection of the middle of Jefferson street, with the middle of Superior street, is S. 60° 14′ 57″ W., and the distance 141 feet.

1*st*. *Observations for the Latitude.* 1858, *August* 13*th*.

	° ′ ″
By 5 circum-meridian altitudes of ζ Pegasi, and 7 circum-meridian altitudes of α Pegasi, both south, combined with 14 observed altitudes of Polaris (α Urs. Minoris) north, - - -	41 39 02.85
1859, *January* 24*th*. By 18 circum-meridian altitudes of β Orionis, south, combined with 20 observed altitudes of Polaris, north, - -	41 39 01.97
By giving the 2d set twice the weight of the first, we get	
Result—Latitude of station, - -	41 39 02.26 N.

When the observations were made for the latitude on the night of August 13th, 1858, the sky to the south was so much clouded that no more observations could be made in that direction, for that object, than are above reported. The result then obtained agrees, however, well with that derived from the satisfactory set of observations made on the night of January 24th, 1859, on the occasion of a second visit to the same station. It is believed that the result reported is a pretty close determination.

2d. Observations for the Time. 1858, *August 13th.*

Sidereal chronometer No. 2557, fast:

1st Set.

	m.	*s.*	
By 7 observations on α Coronæ Borealis, west (at 19*h*. 29*m*.) -	48	15.59	
By 11 observations on α Andromedæ, east, (at 19*h*. 59*m*.) - -	48	15.31	
2d Result—Chronometer No. 2557, fast (at 19*h*. 44*m*.) - -	48	15.45	*m*. *s*.
			+ 48 15.45

2d Set.

By 12 pairs of equal altitudes of α Cygni, observed east and west (at 20*h*. 36*m*. 38.43*s*.) - -	+ 48 14.85
Result adopted—Chronometer No. 2557, fast of sidereal time for this station, Aug. 13th, 1858, (at 20*h*. 10*m*.) - - - -	+ 48 15.15

3d. The Longitude.

The above determination of the Toledo time, and the Chicago time derived from the observations made there on the nights of August 4th and 12th, combined with the following telegraphic signals, give us the longitude of Toledo, Ohio, as follows, viz:—

Determination of the Difference of Longitude between Chicago and Toledo, Ohio, by electric signals for comparisons of time, August 13th, 1858.

Sidereal Chronometer No. 2557, fast, of Toledo, sidereal time, (at 20*h*. 49*m*. sidereal time,) 48*m*. 15*s*.30.

Rate per sidereal day, + 5*s*.62; or per sidereal hour, + 0*s*.234.

Mean solar Chronometer No. 141, slow, of Chicago, mean solar time, (at 11*h*. 03*m*. mean time,) 4*m*. 28*s*.5.

Rate per mean solar day, — 0*s*.187; or per mean solar hour, — 0*s*.0078.

1st.—Chicago signals recorded at both stations.

Times of signals given at Chicago by mean solar Chronometer No. 141.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals, as noted at Toledo, by sidereal Chronometer No. 2557.	Toledo correct sidereal time of Chicago signals.	Chicago reduced sidereal time of Chicago signals.	Difference of Longitude by each signal.—Toledo east of the meridian of Chicago observing station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
10 58 50	11 03 18.5	21 37 13.5	20 48 58.2	20 32 36.55	0 16 21.65
11 01 50	11 06 18.5	21 40 14	20 51 58.69	20 35 37.04	0 16 21.65
11 04 50	11 09 18 5	21 43 14.5	20 54 59.18	20 38 37.54	0 16 21.64
11 07 50	11 12 18.5	21 46 15	20 57 59.66	20 41 38.03	0 16 21.63

1st Mean.—Electric signals sent from Chicago to Toledo, Ohio, 0 16 21.642

2d.—Toledo signals recorded at both stations.

Times of signals given at Toledo, by sidereal Chronometer No. 2557.	Times of Toledo signals as noted at Chicago by mean solar Chronometer No. 141.	Chicago corrected mean solar time of Toledo signals.	Chicago reduced sidereal time of Toledo signals.	Toledo correct sidereal time of Toledo signals.	Difference of Longitude by each signal.—Toledo east of the meridian of Chicago observing station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
21 52 15	11 13 49	11 18 17.5	20 47 38.01	21 03 59.64	0 16 21.63
21 55 15	11 16 49	11 21 17.5	20 50 38.51	21 07 00.13	0 16 21.62
21 58 16	11 19 49	11 24 17.5	20 53 39.00	21 10 00.62	0 16 21.62
22 01 18.5	11 22 51	11 27 19.5	20 56 41.50	21 13 03.10	0 16 21.60

2d Mean.—Electric signals sent from Toledo, Ohio, to Chicago, 0 16 21.618

1st Mean.—Electric signals sent from Chicago to Toledo, Ohio, as above, - - - - - - - - - - 0 16 21.642

Result:—Toledo Observing Station is east, in longitude of Chicago observing Station No. 3, by a mean of the two sets of signals, - - - - - - - - - - — 0 16 21.63

	h.	m.	s.
Brought forward,	— 0	16	21.63
Longitude of Chicago observing station No. 3, west of the meridian of Greenwich, -	+ 5	50	31.20
Longitude of the Toledo observing station, west of the meridian of Greenwich, - -	+ 5	34	09.57

Equal, in arc, to - - - 83° 32′ 23″.55 W.
Latitude, as before, - - - 41° 39′ 02″.26 N.

From true azimuths from observations on Polaris, with the theodolite, and measured distances from the observing station, we are enabled to give the following table of the latitudes and longitudes of positions in the city of Toledo, viz.—

	North Latitude.	Longitude West of Greenwich.	
		In arc.	In Time.
1. Intersection of the middle of Jefferson Street, with the middle of Superior Street, - - - -	° ′ ″ 41 39 01.57	′ ′ ″ 83 32 25.16	h. m. s. 5 34 09.68
2. Steeple of the Methodist Church on the most western corner of Superior and Madison Streets,	41 39 05.92	83 32 22.42	5 34 09.49
3. Steeple of the Congregational Church on St. Clair Street, between Jefferson and Madison Streets, - - - - - - - - -	41 39 02.71	83 32 20.18	5 34 09.34
4. The Rail Road Depot, (ticket office,) - - - - - - - - -	41 38 47.04	83 32 17.75	5 34 09.19

On the map accompanying the report of Captain Andrew Talcott, of his operations and observations in determining the boundary line between the States of Michigan and Ohio, in the year 1833 (see Doc. No. 497 of the House of Representatives, of the 23d Congress, 1st Session), he places Toledo in latitude 41° 38′ 43″, and in longitude 83° 22′ 28″=5*h*. 33*m*. 29.87*s*. west of Greenwich, as near as we can measure by the map scale. Our latitudes agree well, considering the difference of stations occupied; but in longitude, my determination places Toledo 9′ 50″ in arc = 39.33*s*. of time west of the position given to it on Captain Talcott's map, as printed on a scale of 5 miles to 1 inch, to accompany his report. This difference in longitude is equal to 8.48 statute miles.

X. PRAIRIE DU CHIEN, WISCONSIN.

Station.—This station is 122 feet due north from the front door of the Telegraph Office at the depot of the Milwaukee and Mississippi Rail Road, on the left bank of the Mississippi river.

1*st.* *Observations for the Latitude.* 1858, *July* 13*th.*

By 10 observed altitudes of α Ursæ Minoris (Polaris,) north, combined with 24 circum-meridian altitudes of β Aquarii, south; Latitude of station	° ′ ″ 43 02 01.35 N.

The sky was so much clouded to the north, all night, that I could obtain no more than ten observations on Polaris, and β Aquarii was the only star that could be observed on, south, for the latitude. It was only by watching the sky until an hour and a half past midnight, that the above result could be obtained. Still later watching was necessary, as will presently appear, to obtain the desired observations for the *time* at this place.

2*d.* *Observations for the Time.* *Same night.*

Sidereal chronometer No. 2557, fast:

1*st Set.*

	h. *m.* *s.*		
By 16 observations on α Coronæ Borealis, west (at 18*h.* 07*m.*)	1 15 39.18		
By 9 observations on α Andromedæ, east (at 20*h.* 43*m.*)	1 15 39.94		
1*st Result*—Chronometer No. 2557, fast (at 19*h.* 25*m.*)	1 15 39.56	*h.* *m.* *s.*	
		+ 1 15 39.56	

2*d Set.*

By 7 observations on α Bootis (Arcturus) west (at 17*h.* 39*m.*)	1 15 39.60		
By 12 observations on α Lyræ, also west (at 22*h.* 05*m.*)	1 15 40.49		
Mean from 2 West Stars (at 19*h.* 52*m.*)	1 15 40.04		
By 12 observations on α Cygni, east (at 17*h.* 10*m.*)	1 15 39.43		

	h.	m.	s.	h.	m.	s.
2d Result—Chronometer No. 2557, fast (at 18*h*. 31*m*.) - -	1	15	39.74	+ 1	15	39.74
Result adopted—Chronometer No. 2557, fast of sidereal time for this station (at 18*h*. 58*m*.)				+ 1	15	39.65

3*d*. *The Longitude.*

The above determination of the Prairie du Chien time, and the Chicago time as observed on the nights of the 12th and 15th of July, already given at pp. 358 and 359 of Vol. VI. (No. 60) of the Society's Proceedings, and the rates of the two chronometers between those two dates, given at page 362 of the same volume, combined with the following telegraphic signals, give us the longitude of our Prairie du Chien station, as follows, viz.—

Determination of the difference of Longitude between Chicago and Prairie du Chien, Wisconsin, by electric signals for comparisons of time, July 13, 1858.

Sidereal Chronometer No. 2557, fast, of Prairie du Chien sidereal time, (at 18*h*. 47*m*. sidereal time,) 1*h*. 15*m*. 39*s*.61.

Rate per sidereal day, + 4*s*.91; or per sidereal hour, + 0*s*.2045.

Mean solar Chronometer No. 141, slow, of Chicago mean solar time, (at 11*h*. 34*m*. mean time,) 4*m*. 44*s*.51.

Rate per mean solar day, — 0*s*.03; or per mean solar hour, — 0*s*.0013.

1st.—Chicago signals recorded at both stations.

Times of signals given at Chicago by mean solar Chronometer No 141.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals, as noted at Prairie du Chien by sidereal Chronometer No. 2557.	Prairie du Chien correct sidereal time of Chicago signals.	Chicago reduced sidereal time of Chicago signals.	Difference of Longitude by each signal.—Prairie du Chien west of the meridian of Chicago observing station No. 2.
h. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.
11 29 20	11 34 04.51	20 02 50.5	18 47 10.89	19 01 14.35	0 14 03.46
11 32 10	11 36 54.51	20 05 41	18 50 01.38	19 04 04.81	0 14 03.43
11 35 20	11 40 04.51	20 08 51.5	18 53 11.87	19 07 15.33	0 14 03.46
11 58 50	12 03 34.51	20 32 25.5	19 16 45.79	19 30 49.19	0 14 03.40
12 02 00	12 06 44.51	20 35 36	19 19 56.28	19 33 59.71	0 14 03.43

1st Mean.—Electric signals sent from Chicago to Prairie du Chien, 0 14 03.436

2d.—Prairie du Chien signals recorded at both stations.

Times of signals given at Prairie du Chien by sidereal Chronometer No. 2557.	Times of Prairie du Chien signals, as noted at Chicago by mean solar Chronometer No. 141.	Chicago correct mean solar time of Prairie du Chien signals.	Chicago reduced sidereal time of Prairie du Chien signals.	Prairie du Chien correct sidereal time of Prairie du Chien signals.	Difference of Longitude by each signal.—Prairie du Chien west of the meridian of Chicago observing station No. 2.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
20 41 30	12 07 53	12 12 37.51	19 39 53.68	19 25 50.26	0 14 03.42
20 44 30.5	12 10 53	12 15 37.51	19 42 54.17	19 28 50.75	0 14 03.42
20 47 31	12 13 53	12 18 37.51	19 45 54.66	19 31 51.24	0 14 03.42
20 50 30.5	12 16 53	12 21 36.51	19 48 54.16	19 34 50.73	0 14 03.43

2d Mean.—Electric signals sent from Prairie du Chien to Chicago, 0 14 03.422

1st Mean.—Electric signals sent from Chicago to Prairie du Chien, as above, - - - - - - - - - - - 0 14 03.436

Result:—Prairie du Chien observing station is west, in longitude, of Chicago observing station No. 2, by a mean of the two sets of signals, - - - - - - - - - + 0 14 03.429

	h. m. s.
Longitude of Chicago observing station No. 2, west of the meridian of Greenwich, - -	+ 5 50 31.15
Longitude of Praire du Chien observing station, west of the meridian of Greenwich, - -	6 04 34.58
Equal, in arc, to - - - -	91° 08′ 38″.7 W.
Latitude of this station, as above, -	43° 02′ 01″.35 N.

The above determination will be found, we think, to correspond very nearly with that of Mr. J. N. Nicollet, derived by him from observations made in the year 1839, while employed in exploring the hydrographical basin of the Mississippi. His station was the American Fur Company's house, near Fort Crawford. An interesting discussion of the several observations which led him to the longitude which he adopted for that station, will be found in his report at page 117, of Senate Document No. 273, of the 26th Congress, 2d Session, printed in the year 1843.

He there states the longitude of that point to be,

	h. m. s.
West of the meridian of Greenwich, - -	6 04 35.55
Equal, in arc, to - - -	91° 08′ 53″.25*

In his table of geographical positions, however, at page 123, he states that position to be in

Latitude - - - -	43° 03′ 06″ N.
Longitude, west from Greenwich, -	6*h*. 04*m*. 37.3*s*.

* Erroneously printed in that document, 93°, &c.

I only spent the night in observing at Prairie du Chien, and was obliged to leave that place early the next morning, on my return to Chicago. Hence I had no opportunity for making any survey to connect our two stations, and thus determine accurately their relative positions. In looking up the Mississippi, however, from my station, I observed that its course upward appeared, when compared with the direction of the North Star (Polaris) to be a very little west of north. The difference of our longitudes, reduced to a common point, is not probably more than one second of time; and, judging by the eye, of the distance from my station to the Fur Company's old house, our latitudes appear to agree very closely.

XI. DUNLEITH, ILLINOIS.

Station.—One hundred feet east from the left shore of the Mississippi river, between the freight depot and the passenger house of the Northwestern terminus of the Illinois Central Rail Road. From the observing station to a point perpendicularly under the most northern of the two cupolas on the north end of the ticket office, of this rail road depot, is S. 13° W. 250 feet, horizontal measurement.

1*st.* *The Latitude.* 1859, *February* 22*d.*

	°	′	″
By 37 circum-meridian altitudes of β Orionis, south, combined with 24 altitudes of Polaris (α Ursæ Minoris,) north, - - - -	42	29	45.16
Same night.—By 26 circum-meridian altitudes of α Hydræ, south, combined with 14 other altitudes of Polaris, observed 5 hours later than the previous set, - - - - -	42	29	44.65
Result—Latitude of station, - -	42	29	44.9 N.

2*d.* *Observations for the Time.* 1859, *February* 21*st.*

Sidereal chronometer No. 2557, fast:

1*st Set.* *Before the telegraphic signals.*

	h.	*m.*	*s.*
By 10 observations on α Arietis, west (at 6*h.* 16*m.*) - -	1	38	14.48
By 11 observations on γ′ Leonis, east (at 6*h.* 39*m.*) - -	1	38	14.67

1*st Result. Before the signals*—

	h.	m.	s.	h.	m.	s.
Chronometer No. 2557, fast (at 6*h*. 27*m*.)	1	38	14.57	+ 1	38	14.57

2d Set. After the telegraphic signals.

By 13 observations on α Bootis (Arcturus) east (at 10*h*. 37*m*.)	1	38	15.60			
By 14 observations on β Geminorum, west (at 11*h*. 11*m*.)	1	38	14.88			
2d Result. After the signals— Chronometer No. 2557, fast (at 10*h*. 54*m*.)	1	38	15.24	+ 1	38	15.24
Result adopted—Chronometer No. 2557, fast of sidereal time for this station (at 8*h*. 40*m*.) Feb. 21st, 1859				+ 1	38	14.90

1859, *Feb. 22d. At the same Station.*

Sidereal chronometer No. 2557, fast:

1*st Set. Before the telegraphic signals.*

	h.	m.	s.	h.	m.	s.
By 10 observations on α Arietis, west (at 6*h*. 03*m*.)	1	38	19.55			
By 10 observations on γ' Leonis, east (at 6*h*. 31*m*.)	1	38	20.09			
1*st Result. Before the signals*— Chronometer No. 2557, fast (at 6*h*. 17*m*.)	1	38	19.82	+ 1	38	19.82

2d Set. After the telegraphic signals.

By 14 observations on β Geminorum, west (at 11*h*. 02*m*.)	1	38	20.52			
By 11 observations on α Bootis, east (at 11*h*. 26*m*.)	1	38	20.79			
2d Result. After the telegraphic signals——Chronometer No. 2557, fast (at 11*h*. 14*m*.)	1	38	20.65	+ 1	38	20.65

Result adopted—Chronometer No. 2557, fast of sidereal time for this station (at 8*h*. 46*m*.) Feb. 22d, 1859, - - - - | *h*. *m*. *s*. + 1 38 20.23

3*d*. *The Longitude.*

We have two determinations of the longitude of our Dunleith station. The first is derived from the time-observations made at that station, and the signals interchanged with Chicago, on the night of Feb. 21st. The second is derived from the similar observations and signals made on the night of Feb. 22d. They both depend in part upon the run of the mean solar chronometer No. 141, while at rest at Chicago as ascertained by the time-observations made there on the nights of Feb. 20th and 23d, already given.

The telegraphic signals, and the results, for the 1st determination, are as follows, viz.—

Determination of the difference of Longitude between Chicago and Dunleith, Illinois, by electric signals for comparisons of time, February 21st, 1859.

Sidereal Chronometer No. 2557, fast, of Dunleith, sidereal time, (at 9*h*. 41*m*. sidereal time,) 1*h*. 38*m*. 14.90*s*.

Rate per sidereal day, + 5*s*.308; or per sidereal hour, + 0*s*.221.

Mean Solar Chronometer No. 141, slow, of Chicago, mean solar time, (at 10*h*. 47*m*. mean time,) 4*m*. 42*s*.14.

Rate per mean solar day, — 0*s*.746; or per mean solar hour, — 0*s*.03109.

1st.—Chicago signals recorded at both stations.

Times of Signals given at Chicago by mean solar Chronometer No. 141.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals as noted at Dunleith by sidereal Chronometer No. 2557.	Dunleith correct sidereal time of Chicago signals.	Chicago reduced sidereal time of Chicago signals.	Difference of Longitude by each signal. Dunleith west of the meridian of Chicago observing station No. 3.
h. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.
10 42 10	10 46 52.14	10 19 16.5	8 41 01.60	8 53 06.27	0 12 04.67
10 45 10	10 49 52.14	10 22 17	8 44 02.09	8 56 06.76	0 12 04.67
10 48 10	10 52 52.14	10 25 17.5	8 47 02.58	8 59 07.26	0 12 04.68

1st Mean.—Electric signals sent from Chicago to Dunleith, 0 12 04.673

2d.—Dunleith signals recorded at both stations.

Times of signals given at Dunleith by sidereal Chronometer No. 2557.	Times of Dunleith signals as noted at Chicago by mean solar Chronometer No. 141.	Chicago correct mean solar time of Dunleith signals.	Chicago reduced sidereal time of Dunleith signals.	Dunleith correct sidereal time of Dunleith signals.	Difference of Longitude by each signal.—Dunleith west of the meridian of Chicago observing station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
10 28 18	10 51 10	10 55 52.14	9 02 07.75	8 50 03.06	0 12 04.69
10 31 18.5	10 54 10	10 58 52.14	9 02 08.24	8 53 03.55	0 12 04.69
10 34 19.0	10 57 10	11 01 52.15	9 08 08.74	8 56 04.04	0 12 04.70
10 43 20.5	11 06 10	11 10 52.15	9 17 10.22	9 05 05.51	0 12 04.71
10 46 21	11 09 10	11 13 52.15	9 20 10.71	9 08 06.00	0 12 04.71

2d Mean.—Electric signals sent from Dunleith to Chicago, 0 12 04.70

1st Mean.—Electric signals sent from Chicago to Dunleith, as above, - - - - - - - - - - 0 12 04.673

Result:—Dunleith Station No. 1, is west, in longitude of Chicago observing Station No. 3, by a mean of the two sets of signals, - - - - - - - - - - — 0 12 04.686

Longitude of Chicago observing station No. 3, west of the meridian of Greenwich, - + 5 50 31.20

Determination 1st.

Longitude of Dunleith observing station, west of the meridian of Greenwich, - - - 6 02 35.88

For the second determination, reference must be had to the time-observations at Dunleith, of the 22d of February; and to those at Chicago, as before stated, of the 20th and 23d of February, and to the following telegraphic signals, viz.—

Determination of the difference of Longitude between Chicago and Dunleith, Illinois, by electric signals for comparisons of time, February 22, 1859.

Sidereal Chronometer No. 2557, fast, of Dunleith sidereal time, (at 10*h*. 00*m*. sidereal time), 1*h*. 38*m*. 20*s*.51.

Rate per sidereal day, + 5*s*.308; or per sidereal hour, + 0*s*.221.

Mean solar Chronometer No. 141, slow, of Chicago, mean solar time, (at 12*h*. 01*m*. 42*s*. mean time), 4*m*. 42*s*.92.

Rate per mean solar day, — 0*s*.746; or per mean solar hour, — 0*s*.03109.

1st.—Chicago signals recorded at both stations.

Times of signals given at Chicago by mean solar Chronometer No. 141.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals, as noted at Dunleith by sidereal Chronometer No. 2557.	Dunleith correct sidereal time of Chicago signals.	Chicago reduced sidereal time of Chicago signals.	Difference of Longitude by each signal.—Dunleith west of the meridian of Chicago observing station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
11 57 00	12 01 42.92	11 38 22	10 00 01.50	10 12 05.91	0 12 04.41
12 00 00	12 04 42.92	11 41 22.5	10 03 01.99	10 15 06.40	0 12 04.41

1st Mean.—Electric signals sent from Chicago to Dunleith, 0 12 04.41

2d.—Dunleith signals recorded at both stations.

Times of signals given at Dunleith by sidereal Chronometer No. 2557.	Times of Dunleith signals, as noted at Chicago by mean solar Chronometer No. 141.	Chicago correct mean solar time of Dunleith signals.	Chicago reduced sidereal time of Dunleith signals.	Dunleith correct sidereal time of Dunleith signals.	Difference of Longitude by each signal.—Dunleith west of the meridian of Chicago observing station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
11 47 23.5	12 06 00	12 10 42.93	10 21 07.39	10 09 0 .97	0 12 04.42
11 50 24	12 09 00	12 13 42.93	10 24 07.88	10 12 03.45	0 12 04.43
11 53 24.5	12 12 00	12 16 42.93	10 27 08.37	10 15 03.94	0 12 04.43
11 56 25	12 15 00	12 19 42.93	10 30 08.87	10 18 04.43	0 12 04.44

2d Mean.—Electric signals sent from Dunleith to Chicago, - 0 12 04.43

1st Mean.—Electric signals sent from Chicago to Dunleith, as above, - - - - - - - 0 12 04.41

Result: Dunleith station No. 2, is west in longitude of Chicago station No. 3, by a mean of the two sets of signals, + 0 12 04.42

Longitude of Chicago Station No. 3, - + 5 50 31.20

Determination 2d.

Longitude of Dunleith observing station, west of the meridian of Greenwich, by this 2d determination of Feb. 22d, 1859, - - - - 6 02 35.62

Determination 1st.

By the observations and signals of February 21st, as above given, - - - - 6 02 35.88

Result adopted—Longitude of the Dunleith observing station, west of the meridian of Greenwich, by a mean of the two determinations, - - 6 02 35.75

Equal, in arc, to - - - 90° 38′ 56″.25

Latitude of this station, as before given, - 42° 29′ 44″.9 N.

Result—By the measured offset and azimuth, from this station, given at the beginning of this article XI. the most northern cupola on the top of the ticket-office of the rail road depot, is in—

Latitude - - - -	42° 29′ 42″.5 N.
Longitude, west of Greenwich, - -	6*h*. 02*m*. 35.8*s*.
Equal, in arc, to - - -	90° 38′ 57″ W.

Dunleith is at the north-western terminus of the Illinois Central Rail Road, on the east bank of the Mississippi river, and occupies the site of the old Indian village of *Sinipi*. Extensive earth works, consisting of mounds thrown up in oval forms by the tribe which formerly resided here, still exist at Dunleith, in a state of perfect preservation. We had no time to devote to them that minute exploration which would no doubt show their contents to be similar to those of the numerous Indian mounds examined by Professor J. A. Lapham, of Milwaukee, and described in his valuable memoir, published in the year 1855, by the Smithsonian Institution, under the title of "The Antiquities of Wisconsin."

The position of *Sinipi* (now Dunleith), is laid down on the map of Nicollet, in latitude 42° 36′ north, and in longitude, west of the meridian of Greenwich, 6*h*. 02*m*. 38.6*s*. = 90° 39′ 39″. Nicollet did not, however, make any astronomical observations at this or any other point on the Mississippi, between the "Head of the Upper Rapids, below Port Biron and Parkhurst," and "Prairie du Chien. We infer from his report, that the extensive reach of the Mississippi, from latitude 41° 36′ 08″ to latitude 43° 03′ 06″, was laid down on his map, from the surveys made under the direction of the General Land Office of the United States, checked by his observations made at the two extreme points above mentioned. (See his table of Geographical positions, page 123 of Senate Doc. No. 237, of the 26th Congress, 2d Session.) Nicollet's longitude, thus derived, agrees very closely with ours; but in latitude he is 6′ 18″ = $7\frac{1}{4}$ miles north of us. Dubuque is placed equally out of position, in latitude, on his map; but it appears to be very correct in longitude.

In the last map issued from the War Department of the "Territory of the United States, from the Mississippi to the Pacific Ocean," these cities are laid down correctly in longitude, but they are placed four minutes, = $4\frac{6}{10}$ miles too far north in latitude.

The boundary line between the State of Illinois on the north, and the State of Wisconsin on the south, is defined to be along the parallel of 42° 30′ of latitude.

We regret that we had not time to make a connection, by survey, from our astronomical station at Dunleith, to the stone monument on the east bank of the Mississippi river, erected to mark the western terminus of this boundary line. From a close reconnoissance, however, we infer that the latitude of this monument is about 42° 30′ 20″, and hence, that the monument is placed about one-third of a mile too far to the north.

XII. DUBUQUE, IOWA.

This city is situated on the west bank of the Mississippi river, opposite to Dunleith, Illinois.

From a reconnoissance and bearings observed from several points in Dunleith, based on the latitude and longitude of our Dunleith station, as already given, we are enabled to give the approximate position of Dubuque as follows. The distance between the two points being, in a direct line, not more than one and one-fourth mile, viz.—

CENTRE OF THE CITY OF DUBUQUE.

Latitude, - - - -	42° 29′ 55″ N.
Longitude, west of the meridian of Greenwich,	6*h*. 02*m*. 40*s*.
Equal, in arc, to - - -	90° 40′ 00″

XIII. FULTON, ILLINOIS.

This city is situated on the east shore of the Mississippi river, 136 miles west of Chicago, by the track of the Chicago, Dixon, and Iowa Air Line Rail Road, of which it is, at present, the western terminus. Immediately opposite is the city of Lyons, situated on the west shore of the Mississippi. Observations were made at both places, and the observing stations were connected by a triangulation and azimuths, derived from an observation on Polaris (α Ursæ Minoris). From the astronomidal station at Fulton, to that at Lyons, is 3595.5 feet, on an azimuthal course of N. 68° 43′ W. Hence the Lyons station is + 12″.89 north of the parallel and + 44″.29 in arc, = + 2*s*.95 in time, west of the meridian of the Fulton Station. We shall have occasion to use this difference of latitude in applying a common correction (— 1″.92 in the one case, and + 1″.92 in the other), to the observed latitudes of these two stations, in order to render the difference of their latitudes consistent with the result of the survey. The survey gave us, also, the longitude of the Lyon's Station, based on that of the

Fulton Station, derived from comparison by means of the two chronometers, with the longitude of Chicago.

We now proceed to give the observations at Fulton :—

Position of the Fulton Station.—From this station to the intersection of the middle of Base Street, with the middle of Cherry Street, is N. 53° 24′ 53″ W. (true) and the distance is 302 feet. Hence the reduction in latitude is + 1″.71, and in longitude + 3″.20 in arc, or + 0*s*.214 in time.

1*st. Observations for the Latitude.* 1858, *March* 24*th.*

	° ′ ″
By 19 circum-meridian altitudes of Polaris (lower transit) north, combined with 26 circum-meridian altitudes of α Virginis, south, - - -	41 52 03.25
Correction due to survey, connecting with the Lyons observing station, - - - -	— 1.92
Latitude of station adopted, - -	41 52 01.33 N.

2*d. Observations for the Time.* 1*st.* 1858, *March* 24*th.*

Mean solar chronometer was fast of mean solar time at apparent noon:

By 2 pairs of equal altitudes of the sun's lower limb,	+ 5*m*. 10.72*s*.

	h. *m*. *s*.
By comparison—Chronometer No. 2557, was fast of sidereal time for this station at apparent noon (say at 0*h*. 14*m*. sidereal time) - -	+ 1 00 13.75

2*d.* 1858, *March* 28*th.*

Sidereal chronometer No. 2557, fast:

By 10 observations on α Tauri, west, and 9 observations on β Tauri, also west (at 8*h*. 40*m*.)	+ 1 00 31.93
By 24 observations on ε Bootis, east (at 10*h*. 30*m*.)	+ 1 00 31.87
Result—Chronometer No. 2557, fast of sidereal time for this station (at 9*h*. 35*m*. sidereal time)	+ 1 00 31.90
By comparison—Chronometer No. 141, was fast of mean solar time for this station (at 9*h*. 10*m*. mean time) - - - -	+ 5 07.94

3d. The Longitude.

1. By the transmission of mean solar chronometer No. 141, from Chicago to Fulton and back to Chicago, between the 22d and 29th of March, 1858. *Rate*, during the elapsed time, — 0*s*.744 per mean solar day.

1858, *March* 24*th*.—Chronometer No. 141, was fast of Fulton mean solar time at apparent noon,		*m*. *s*. + 5 10.72
1858, *March* 22*d*.—Slow of Chicago mean solar time at Chicago, apparent noon, - - -	*m*. *s*. — 4 56.26	
Elapsed time, 2.007 mean solar days, allowing for diff. of longitude of stations, × — 0*s*.744, =	— 1.49	
Chronometer No. 141, slow of Chicago mean time, at the period of Fulton apparent noon, of March 24th, 1858, - - -	— 4 57.75	
		— 4 57.75
(*a*) Difference—Fulton, west of Chicago, -		+ 10 08.47

2. By sidereal chronometer No. 2557:

1858, *March* 24*th*.—Chronometer fast of Fulton sidereal time (at 0*h*. 14*m*. sidereal time)		+ 1 00 13.75
1851, *March* 22*d*.—Fast of Chicago sidereal time (at 0*h*. 06*m*. 44*s*. sidereal time) - -	*h*. *m*. *s*. + 0 49 55.67	
Elapsed time, allowing for diff. in long. = 2.012 sider. days, × + 4*s*.23, the rate per sidereal day,	= + 8.51	
Chronometer No. 2557, fast of Chicago sidereal time, at the period of the Fulton time observations,	+ 50 04.18	
		+ 50 04.18
(*b*) Difference.—Fulton west of Chicago, - -		+ 10 09.57

If we take the time-observations at Fulton, of the 28th March, 1858,

as the basis of the comparisons, a similar process to the above, will give us the following additional results, viz.—

	m.	*s.*
(*c*) By mean solar chronometer No. 141: Fulton west of Chicago, - - -	+ 10	08.96
(*d*) By sidereal chronometer No. 2557: Fulton west of Chicago, - - - - -	+ 10	09.15
Mean of the 4 results, *a*, *b*, *c*, *d*, - - -	+ 10	09 04
Longitude of Chicago observing station No. 1,	+ 5	50 30.99

1*st Determination.*

Longitude of Fulton observing station, by the run of the two chronometers, west of the meridian of Greenwich, - - - - -	6	00	40.03

On this journey, the chronometers were transported in the rail cars. Each chronometer was carried in a small basket, resting within a nest of elastic curled hair, with a lining of soft green baize between the hair and the chronometer. Every pains was taken to protect them from jolts and all kinds of rough usage. From long experience, I believe that good results for differences of longitude, derived from transporting chronometers, depend much more upon this sort of care and attention to them, than upon any other circumstances attending the operation. A few seconds of time are easily lost by careless handling of the chronometers.

In the present month of June, 1859, I determined to test the above result for the longitude, by the method more recently followed, of transmitting time-signals by the electric telegraph.

For this purpose, the time-observations of Chicago, given under the dates of June the 22d and 24th, and those now to be given under the date of June 23d, together with the signals, were made.

1859, *June* 23*d*. *At the Fulton Observing Station, already described.*

Sidereal chronometer No. 2557, fast:

1*st Set. Before the Signals.*

	h.	*m.*	*s.*
By 8 observations on α Lyræ, east (at 15*h*. 20*m*.) - - -	1	51	04.00
By 12 observations on α (12) Canum Venaticorum, west (at 16*h*. 00*m*.)	1	51	04.21

	h. m. s.	h. m. s.
1*st Result*—Chronometer No. 2557, fast (at 15*h*. 40*m*.) - -	1 51 04.10	+ 1 51 04.10

2d Set. After the Signals.

By 14 observations on ε Bootis, west (at 18*h*. 03*m*.) - - -	1 51 04.47	
By 10 observations on ζ Cygni, east (at 18*h*. 23*m*.) - - -	1 51 04.49	
2*d Result*—Chronometer No. 2557, fast (at 18*h*. 13*m*.) - -	1 51 04.48	+ 1 51 04.48
Result adopted—Chronometer No. 2557, fast of sidereal time for this station (at 16*h*. 56*m*.)		+ 1 51 04.29

The above result, and the results of the time-observations at Chicago of the 22d and 24th of June, applied to the telegraphic signals, give us a second determination of the longitude of our Fulton Station, as follows, viz.—

Determination of the Difference of Longitude between Chicago and Fulton, Illinois, by electric signals for comparisons of time, June 23d, 1859.

Sidereal Chronometer No. 2557, fast, of Fulton, sidereal time, (at 16*h*. 29*m*. 23*s*. sidereal time), 1*h*. 51*m*. 04*s*.16.

Rate per sidereal day, + 7*s*.025; or per sidereal hour, + 0*s*.2927.

Mean solar Chronometer No. 141, slow, of Chicago, mean solar time (at 10*h*. 32*m*. 20*s*. mean time) 4*m*. 50*s*.03.

Rate per mean solar day, — 0*s*.19; or per mean solar hour, — 0*s*.0079.

1st.—Chicago signals recorded at both stations.

Times of signals given at Chicago by mean solar Chronometer No. 141.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals, as noted at Fulton by sidereal Chronometer No. 2557.	Fulton correct sidereal time of Chicago signals.	Chicago reduced sidereal time of Chicago signals.	Difference of Longitude by each signal.—Fulton west of the meridian of Chicago observing station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
10 27 30	10 32 20.03	18 20 27	16 29 22.84	16 39 31.57	0 10 08.73
10 30 30	10 35 20.03	18 23 27.5	16 32 23.33	16 42 32.06	0 10 08.73
10 33 30	10 38 20.03	18 26 28	16 35 23.82	16 45 32.55	0 10 08.73
10 45 30	10 50 20.03	18 38 30	16 47 25.75	16 57 34.52	0 10 08.77
1st Mean.—Electric signals sent from Chicago to Fulton, -					0 10 08.74

2d.—Fulton signals recorded at both stations.

Times of signals given at Fulton, by sidereal Chronometer No. 2557.	Times of Fulton signals as noted at Chicago by mean solar Chronometer No. 141.	Chicago coreect mean solar time of Fulton signals.	Chicago reduced sidereal time of Fulton signals.	Fulton correct sidereal time of Fulton signals.	Difference of Longitude by each signal.—Fulton west of the meridian of Chicago observing station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
18 29 28.5	10 36 30	10 41 20.03	16 48 33.05	16 38 24.29	0 10 08.76
18 32 29.0	10 39 30	10 44 20.03	16 51 33.54	16 41 24.78	0 10 08.76
18 35 29.5	10 42 30	10 47 20.03	16 54 34.03	16 44 25.27	0 10 08.76

2d Mean.—Electric signals sent from Fulton to Chicago, - 0 10 08.76

1st Mean.—Electric signals sent from Chicago to Fulton, as above, - - - - - - - 0 10 08.74

Result:—Fulton Observing Station is west, in longitude of Chicago observing Station No. 3, by a mean of the two sets of signals, - - - - - - - - - - + 0 10 08.75

Longitude of Chicago observing station No. 3, + 5 50 31.20

2*d Determination*, *June* 23*d*, 1859.

Longitude of Fulton Station, west of the meridian of Greenwich, by the time-observations and the electric signals exchanged June 23d, 1859, - 6 00 39.95

1*st Determination*, *March* 1858.

Longitude of the same station by the time-observations, and the transportation of the two chronometers between the 22d and 29th of March, 1858, above given, - - - - 6 00 40.03

Result adopted—Longitude of Fulton Station, west of the meridian of Greenwich, by a mean of the two determinations, - - - - 6 00 39.99

Equal, in arc, to - - - - 90° 09′ 59″.85

Latitude of this station, as before, - - 41° 52′ 01″.33 N.

By the triangulation, based on the true meridian, made in March, 1858, taking our departure from the astronomical station whose position is above given, we obtain the positions of other stations, serving as permanent points of reference, in Fulton, as follows, viz.—

POSITIONS IN THE CITY OF FULTON, ILLINOIS.	North Latitude.	Longitude West of Greenwich.	
		In arc.	In Time.
1. Intersection of the middle of Cherry Street, with the middle of Base Street,	° ′ ″ 41 52 03	° ′ ″ 90 10 03	*h.* *m.* *s.* 6 00 40.2
2. Dome of the Dement Hotel,	41 52 04	90 10 02.35	6 00 40.16
3. Steeple of the Congregational Church,	41 51 59.2	90 09 50.3	6 00 39.35
4. The centre of Washington Square,	41 52 01.8	90 09 38.4	6 00 38.56
5. Foot of Cherry Street, on the east bank of Mississippi river, at high water mark,	41 52 03	90 10 15.2	6 00 41.01

On Nicollet's map, Fulton is placed in latitude 41° 52′ 43″ N., and longitude 90° 13′ 45″ West of Greenwich, which, in comparison with our result, if we take the centre of Washington Square as the point of reference, is + 41″.2 in latitude, and + 4′ 06″.6 in longitude.

In the last edition (that of 1857) of the map of the territory of the United States, from the Mississippi to the Pacific Ocean, Fulton is laid down in latitude 41° 55′ 27″ N., and in longitude 90° 12′ 19″ W., which, in comparison with our result, is + 3′ 25″ in latitude, and + 2′ 41″ in longitude.

XIV. LYONS, IOWA.

Station.—Near the middle of the garden of Mr. Benjamin Lake's house, on Third Street, at the S. W. corner of Third and Exchange Streets. From the station to the point of intersection of the axes or middles of these two streets, is N. 45° 49′ 30″ E., and the distance is 190 feet.

1*st. Observations for the Latitude.*

Time-stars β Tauri west, and α Bootis (Arcturus) east. Sidereal chronometer fast 1*h.* 00*m.* 31.2*s.* at 9*h.* 57*m.* sidereal. Mean solar chronometer fast 5*m.* 11.4*s.* at 9*h.* 36*m.* mean time.

Latitude of Station. 1858, *March 27th.*

By 22 circum-meridian altitudes of α Hydræ south, and 20 circum-meridian altitudes of α Virginis, also south, combined with 25 circum-meridian altitudes (at lower meridian transit) of Polaris, north,	41° 52′ 11″.78
Correction due to the observations for lat. at Fulton, and the survey connecting the two stations,	+ 1.92
Latitude of station adopted,	41° 52′ 13″.7 N.

2d. *The Longitude.*

This we derive from the survey made to connect the Fulton and Lyons stations, thus:—

	° ′ ″	h. m. s.
Longitude of the Fulton Station, as already given, - -	90 09 59.85 =	6 00 39.99
Lyons Station west in longitude, -	+ 44.29 =	+ 2.95
Longitude, deduced, of Lyons Station,	90 10 44.14 =	6 00 42.94
Latitude, as before, - -	41 52 13.7	

Our survey, based on this result, gives two other positions in Lyons, as follows, viz.—

POSITIONS IN THE CITY OF LYONS, IOWA.	North Latitude.	Longitude West of Greenwich.	
		In arc.	In Time.
1. The intersection of the middle of Exchange Street, with the middle of Third Street, - - -	° ′ ″ 41 52 15	° ′ ″ 90 10 42.3	h. m. s. 6 00 42.8
2. The turret of the Female Institute, - - - - - - - - - -	41 52 10.5	90 11 14.5	6 00 44.97

On Nicollet's map, this position is given + 30″ in latitude, and + 5′ 50″ in longitude greater than our observations give for our station, which is nearly central of the city.

On the other map mentioned, it is + 2′ 02″ in latitude, and + 3′ 57″ in longitude greater than ours.

XV. ALBANY, ILLINOIS.

This place is sometimes called "New Albany." It is situated on the eastern shore of the Mississippi river.

Both chronometers were carried from Fulton to Albany and back to Fulton, between the 25th and 28th of March, 1858. Observations were made at Albany on the nights of the 25th and 26th, both for the latitude and the *time*. The longitude of this place is derived from chronometric comparison with the meridian of Fulton.

Station.—From this station to the intersection of the axes of Maple and Main Streets, is S. 48° 51′ 03″ E. (*true*), and the distance is 89 feet.

1*st. Observations for the Latitude.* 1. 1858, *March 25th.*

By 18 circum-meridian altitudes of α Hydræ, south, combined with 5 altitudes of Polaris, north (clouds prevented more observations on Polaris) - 41° 47′ 23″

2*d.* 1858, *March* 26*th.*

	° ′ ″
By 23 circum-meridian altitudes, at lower meridian transit, of Polaris, north, combined with 21 circum-meridian altitudes of α Virginis, south, -	41 47 20.2
Latitude of station,—giving the result of the 26th, three times the weight of that of the 25th,	41 47 20.9 N.
Reduction to the point of intersection of the axes of Maple and Main Streets, - - -	— 0.6
Result—Latitude of the point of intersection of the axes of Maple and Main Streets, Albany, Ills.	41 47 20.3 N.

2*d. Observations for the Time.* 1*st.* 1858, *March* 25*th.*

Sidereal chronometer No. 2557, fast:

	h. *m.* *s.*
By 6 observations on γ Geminorum, west (at 9*h.* 48*m.*) - - - -	+ 1 00 33.35
By 12 observations on α Bootis, east (at 10*h.* 42*m.*)	+ 1 00 34.87
Result—Chronometer No. 2557, fast of sidereal time for this station (at 10*h.* 15*m.*) -	+ 1 00 34.1
By comparison—Mean Solar chronometer No. 141, was fast of mean solar time for this station (at 10*h.* 00*m.* mean time) - - -	+ 5 23.98

2*d.* 1858, *March* 26*th.*

Sidereal chronometer No. 2557, fast:

	h. *m.* *s.*	
By 10 observations on α Leonis (Regulus), west (at 13*h.* 50*m.*) - - - -		+ 1 00 39.17
By 10 observations on α Lyræ, east (at 14*h.* 10*m.*) - -	1 00 38.78	
By 10 observations on α Aquilæ, also east (at 16*h.* 14*m.*) - -	1 00 38.14	
By 20 observations on 2 East Stars, (at 15*h.* 12*m.*) - -	1 00 38.46	
		+ 1 00 38.46

	h.	m.	s.
Result—Chronometer No. 2557, fast of sidereal time for this station (at 14*h*. 31*m*. sidereal)	+ 1	00	38.81
By comparison—Chronometer No. 141, was fast of mean solar time for this station (at 14*h*. 12*m*. mean time)	+ 5	23.05	

Rates of Chronometers from the 24th to the 28th of March, 1858.

Sidereal chronometer No. 2557, gains per sidereal day,	+ 4*s*.14
Mean solar chronometer No. 141, loses per mean solar day,	— 0*s*.637

3*d*. *The Longitude.*

Albany Station, west of the meridian of Fulton Station, by the Albany time-observations of March 25th:

	s.
By the run of sidereal chronometer No. 2557,	+ 14.49
By the run of mean solar chronometer No. 141,	+ 14.15
By the Albany time-observations of March 26th:	
By the run of sidereal chronometer No. 2557,	+ 14.32
By the run of mean solar chronometer No. 141,	+ 13.97
Mean of these four results,	+ 14.23

	h.	m.	s.
Longitude of Fulton observing station,	+ 6	00	39.99
Longitude deduced of the Albany observing station,	+ 6	00	54.22
Reduction to the intersection of Maple and Main Streets,			— 0.06
Result—Longitude of the intersection of Maple and Main streets, Albany, Ills., west of the meridian of Greenwich,	6	00	54.16
Equal, in arc, to	90°	13′	32″.4 W.
Latitude of the same point, as before,	41°	47′	20″.3 N.

On Nicollet's map, this position is placed in latitude 41° 45′ 37″ N. and in longitude 90° 21′ 52″ W., which differs from our result by — 1′ 43″ in latitude, and + 8′ 30″ in longitude. This place is not laid down on the other map.

A town is now being laid out on the site of an extensive group of

Indian mounds, on the eastern shore of the Mississippi, which is to be called *South Albany*. It is in Illinois, and is situated a little more than a mile below Albany. By our survey, and an observed azimuth of the star Polaris, connected with the above astronomical station, we make the tallest Indian mound, which will be preserved, according to the plan, in the public park of South Albany, in—

Latitude, - - - -	41° 46′ 35″ N.
Longitude, west of Greenwich, - -	6*h*. 00*m*. 56.93*s*.
Equal, in arc, to - - -	90° 14′ 14″ W.

NOTE.—The west end of the ferry which crosses the stream draining the *Marais des Osiers* (corrupted into "*Meredosia Marshes*" on some of the maps, and into "*Marais d'Ogee*" on others) near the left bank of the Mississippi, on the stage road between Albany and the City of Rock Island, was found, by an offset in our survey between Albany and Camanche, to be in—

Latitude, - - - -	41° 46′ 11″.6 N.
Longitude, - -	6*h*. 00*m*. 59.9*s*. = 90° 14′ 58″.5 W.

XVI. CAMANCHE, IOWA.

This town is situated on the western shore of the Mississippi.

By triangulation from our observing station at Albany, and an observed azimuth of Polaris to obtain the true meridian, we derive the position of Camanche, as follows, viz.—

POSITIONS IN CAMANCHE, IOWA.	Latitude, North.	Longitude west from Greenwich.	
		In Arc.	In Time.
	° ′ ″	° ′ ″	*h*. *m*. *s*.
1. Intersection of Main and Maxan Streets, - - - - - - - - -	41 46 58.9	90 15 10	6 01 00.6
2. Flag-staff on Chicago Street, about 100 yards west of the shore of the Mississippi, - - - -	41 46 51.3	90 15 14.6	6 01 00.97

Nicollet's map gives the latitude of Camanche — 1′ 22″ less, and the longitude + 10′ 20″ greater than the above. He probably had no observing station near this point, but depended on other authorities for its position.

XVII. CITY OF ROCK ISLAND, ILLINOIS.

This city is on the left or *south* bank of the Mississippi river,* which, for a short distance above and opposite this place, flows from east to west in its course. The western terminus of the Chicago and Rock Island Rail Road, is here. The rail-way connects, however, by a bridge across the river, with the City of Davenport, in Iowa, situated on the opposite bank of the river; and, under the name of the *Mississippi and Missouri Rail Road*, runs in a direction about W. N. W. to Iowa City, distant 54 miles from Davenport.

Station.—The centre of Washington Square (called, on some of the maps, Church Square) bounded on the north by Illinois street, on the south by Orleans street, on the east by Madison, and on the west by Jefferson street.

1st. The Latitude. 1859, *February 28th.*

By 17 circum-meridian altitudes of α Hydræ, south, combined with 20 altitudes of Polaris, north: latitude of station, - - - - 41° 30′ 37″.8

2d. Observations for the Time. 1859, *February 28th.*

Sidereal chronometer No. 2557, fast:

1st Set.

	h. *m.* *s.*	*h.* *m.* *s.*
By 8 observations on α Arietis, west (at 6*h.* 37*m.*) - -	1 38 38.19	
By 8 observations on γ' Leonis, east (at 6*h.* 56*m.*) - -	1 38 38.06	
1*st Result*—Chronometer fast (at 6*h.* 46½*m.*) - - -	1 38 38.12	
		+ 1 38 38.12

2d Set.

By 10 observations on β Leonis, east (at 8*h.* 04*m.*) - -	1 38 38.59
By 6 observations on α Tauri, and 8 observations on β Tauri, both west (at 8*h.* 26*m.*) - - -	1 38 38.25

* A plan for a city, called "*Rock Island City*," is laid out on Rock river, about 3 miles south of the "*City of Rock Island.*" The two places should not be confounded under names so nearly alike.

2d Result—Chronometer fast (at 8*h*. 15*m*.) - - -	*h*. *m*. *s*. 1 38 38.42	*h*. *m*. *s*.	
		+ 1 38 38.42	
Result adopted—Chronometer No. 2557, fast of sidereal time for this station (at 7*h*. 31*m*.)		+ 1 38 38.27	

Having so good a determination of the *time* by this night's observations, it was a great disappointment, when we went to the telegraph office, to find the communication with Chicago cut off at La Salle, through some misunderstanding there. We were thereby prevented from passing any electric signals this night, but were obliged to wait until the next night.

1859, *March 1st. Same Station.*

Sidereal chronometer No. 2557, fast:			
By 8 observations on α Leonis, east (at 6*h*. 34*m*.) - -	*h*. *m*. *s*. 1 38 42.18		
By 9 observations on γ' Leonis, also east (at 7*h*. 04*m*.) - -	1 38 42.22		
By 17 observations on 2 East Stars (at 6*h*. 49*m*.) - -	1 38 42.20 =	*h*. *m*. *s*. + 1 38 42.20	
By 13 observations on α Tauri, west (at 8*h*. 15*m*.)		+ 1 38 42.21	
Result—Chronometer No. 2557, fast of sidereal time for this station, (at 7*h*. 32*m*.) -		+ 1 38 42.20	

The above observations for the *time* at the City of Rock Island, on the nights of February 28th, and March 1st, give the rate of chronometer No. 2557, for the 24 hours between those dates, + 3*s*.93. This rate applied to the period of the chronometer error of the 1st of March, together with the time observations made at Chicago on the 27th of February and the 4th of March, and the following telegraphic signals, give us the longitude of our "City of Rock Island" station.

Although we returned from Rock Island to Chicago on the evening of March 2d, yet the weather continued so cloudy until the night of the 4th, as to prevent our making earlier observations for the time here.

Thus we have to depend upon five days run of chronometer No. 141, to obtain its rate to be applied to the observations of February 27th, in order to get the Chicago mean solar time of the signals of the 1st of March.

Determination of the difference of Longitude between Chicago and the City of Rock Island, by electric signals for comparisons of time, March 1st, 1859.

Sidereal Chronometer No. 2557, fast, of Rock Island, sidereal time (at $8h.\ 55m.\ 42s.$ sidereal time), $1h.\ 38m.\ 42s.43$.

Rate per sidereal day, $+\ 3s.93$; or per sidereal hour, $+\ 0s.1637$.

Mean solar Chronometer No. 141, slow, of Chicago, mean solar time (at $10h.\ 29m.\ 44s.$ mean time), $4m.\ 43s.50$.

Rate per mean solar day, $-\ 0s.008$; or per mean solar hour, $-\ 0s.0003$.

1st.—Chicago signals recorded at both stations.

Times of signals given at Chicago, by mean solar Chronometer No. 141.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals, as noted at Rock Island by sidereal Chronometer No 2557.	Rock Island correct sidereal time of Chicago signals.	Chicago reduced sidereal time of Chicago signals.	Difference of Longitude by each signal.—Rock Island west of the meridian of Chicago observing station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
10 25 00	10 29 43.50	10 34 24	8 55 41.57	9 07 27.26	0 11 45.69
10 28 00	10 32 43.50	10 37 24.5	8 58 42.06	9 10 27.75	0 11 45.69
10 31 00	10 35 43.50	10 40 25	9 01 42.56	9 13 28.24	0 11 45.68

1st Mean.—Electric signals sent from Chicago to the City of Rock Island, - - - - - - 0 11 45.687

2d.—Rock Island signals recorded at both stations.

Times of signals given at Rock Island by sidereal Chronometer No. 2557.	Times of Rock Island signals as noted at Chicago by mean solar Chronometer No. 141.	Chicago correct mean solar time of Rock Island signals.	Chicago reduced sidereal time of Rock Island signals.	Rock Island correct sidereal time of Rock Island signals.	Difference of Longitude by each signal.—Rock Island west of the meridian of Chicago observing station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
10 43 25.5	10 34 00	10 38 43.50	9 16 28.74	9 04 43.05	0 11 45.69
10 46 26	10 37 00	10 41 43.50	9 19 29.23	9 07 43.54	0 11 45.69
10 49 26.5	10 40 00	10 44 43.50	9 22 29.72	9 10 44.03	0 11 45.69
10 52 27	10 43 00	10 47 43.50	9 25 30.21	9 13 44.52	0 11 45.69

2d Mean.—Electric signals sent from the City of Rock Island to Chicago, - - - - - - 0 11 45.690

1st Mean.—Electric signals sent from Chicago to the City of Rock Island, as above, - - - - - 0 11 45.687

Result:—Rock Island Station is west, in longitude, of Chicago observing Station No. 3, by a mean of the two sets of signals, - - - - - - - + 0 11 45.69

	h.	m.	s.
Brought forward,	+ 0	11	45.69
Longitude of Chicago station No. 3, - -	+ 5	50	31.20

Determination 1st.

Longitude of the centre of Washington Square in the City of Rock Island, west of the meridian of Greenwich, - - - - - 6 02 16.89

P. S. Since presenting the above result, I made, on the 29th of July, 1859, another visit to the City of Rock Island. It was made the occasion of a second determination of the longitude of that place, depending on the time-observations at Chicago given under the dates of July 28th and 31st, the time-observations at the City of Rock Island of July 29th, as given below, and the electric signals of that night. The observations at the same Rock Island Station which was before occupied, were as follows, viz.—

1*st. Observations for the Time.* 1859, *July 29th. At the centre of Washington Square.*

Sidereal chronometer No. 2557, fast:	h.	m.	s.
By 3 observations on ε Bootis, west (at 18*h.* 08*m.*)	+ 1	57	25.19
By 4 observations on ζ Cygni, east (at 18*h.* 18*m.* 40*s.*)	+ 1	57	25.63
Result—Chronometer No 2557, fast of sidereal time for this station (at 18*h.* 13*m.* 20*s.*) -	+ 1	57	25.41

The night was cloudy, but the sky opened clear just long enough to enable us to make the few observations above recorded. They were worked separately and the results were satisfactory. The extreme difference, for chronometer error, in the three on ε Bootis, west, being 0*s.*33 and in the four on ζ Cygni, east, being 1*s.*03. The extreme difference in three (the first not being counted) on ζ Cygni, is 0*s.*47. They were all, however, taken into the count.

These stars being nearly of the same declination, north, (ε Bootis 27° 40′ and ζ Cygni 29° 39′), the result for the time at Rock Island, this night, may, we think, be considered satisfactory.

The elapsed time between the Chicago observations which apply to the first determination (that of March 1st), was five days. That between the Chicago observations which enter into the calculation of this second determination, is only three days. Considering all circumstances we are inclined to assign equal weight to the two determinations. The second one is as follows, viz:—

Determination of the difference of Longitude between Chicago and the City of Rock Island, Illinois, by electric signals for comparisons of time, July 29th, 1859.

Sidereal Chronometer No. 2557, fast, of Rock Island sidereal time (at 19*h*. 53*m*. 36*s*. sidereal time), 1*h*. 57*m*. 25*s*.94.

Rate per sidereal day, + 7*s*.61; or per sidereal hour, + 0*s*.317.

Mean Solar Chronometer No. 141, slow, of Chicago, mean solar time (at 11*h*. 36*m*. mean time), 1*h*. 57*m*. 25*s*.94.

Rate per mean solar day, — 0*s*.755; or per mean solar hour, — 0*s*.03146.

1st.—Chicago signals recorded at both stations.

Times of Signals given at Chicago by mean solar Chronometer No. 141.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals as noted at Rock Island by sidereal Chronometer No. 2557.	Rock Island correct sidereal time of Chicago signals.	Chicago reduced sidereal time of Chicago signals.	Difference of Longitude by each signal. City of Rock Island west of the meridian of Chicago observing station No.3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
11 31 00	11 36 04.19	21 51 02	19 53 36.06	20 05 22.29	0 11 46.23
11 34 00	11 39 04.19	21 54 02.5	19 56 36.55	20 08 22.78	0 11 46.23
11 36 50	11 41 54.19	21 56 53	19 59 27.03	20 11 13.25	0 11 46.22

1st Mean.—Electric signals sent from Chicago to the City of Rock Island, - - - . - - 0 11 46.227

2d.—The City of Rock Island signals recorded at both stations.

Times of signals given at Rock Island by sidereal Chronometer No. 2557.	Times of Rock Island signals as noted at Chicago by mean solar Chronometer No. 141.	Chicago correct mean solar time of Rock Island signals.	Chicago reduced sidereal time of Rock Island signals.	Rock Island correct sidereal time of Rock Island signals.	Difference of Longitude by each signal.— City of Rock Island west of the meridian of Chicago observing station No.3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
22 02 44	11 42 40	11 47 44.20	20 17 04.22	20 05 18.00	0 11 46.22
22 05 44.5	11 45 40	11 50 44.20	20 20 04.71	20 08 18.48	0 11 46.23
22 08 45	11 48 40	11 53 44.20	20 23 05.21	20 11 18.97	0 11 46.24

2d Mean.—Electric signals sent from the City of Rock Island to Chicago, - - - - - - 0 11 46.23

1st Mean.—Electric signals sent from Chicago to the City of Rock Island, as above - - - - - 0 11 46.227

Result:—The centre of Washington Square in the City of Rock Island is west, in longitude, of Chicago observing Station No. 3, by a mean of the two sets of signals, - + 0 11 46.228

	h.	m.	s.
Brought forward	+ 0	11	46.23
Longitude of Chicago Station No. 3, -	+ 5	50	31.20

2d Determination. July 29th, 1859.

Longitude of centre of Washington Square, in the City of Rock Island, - - - -	6	02	17.43
1*st Determination, March 1st*, 1859, - -	6	02	16.89

Result, giving each Determination an equal weight:

Longitude of the centre of Washington Square, in the City of Rock Island, Illinois, west of the meridian of Greenwich, - - - -	6	02	17.16
Equal, in arc, to - - -	90°	34′	17″.4 W.
Latitude of the same station, as before given,	41°	30′	37″.8 N.

By survey, departing from this station, based on an observed azimuth of the sun on the 2d of March, 1859, for comparing our courses with the true meridian, we obtained the positions of other points, in the City of Rock Island, which may be useful for future reference. We give them all in the following table, viz.—

POSITIONS IN THE CITY OF ROCK ISLAND, ILLINOIS.	Latitude North.	Longitude west of Greenwich.	
		In Arc.	In Time.
	° ′ ″	° ′ ″	h. m. s.
1. Centre of Washington Square,	41 30 37.8	90 34 17.4	6 02 17.16
2. Dome of the Court House on Orleans Street, between Elk and Deer Streets, - - - - - -	41 30 33.7	90 34 42.3	6 02 18.82
3. Steeple of the 2d Presbyterian Church, on Illinois Street, between Elk and Deer Streets, -	41 30 37.4	90 34 43.7	6 02 18.91
4. Intersection of Jefferson and Orleans Streets, - - - - -	41 30 35.9	90 34 19.9	6 02 17.33
5. Passenger house of the depot at the western terminus of the Chicago and Rock Island Rail Road,	41 30 41	90 34 12.8	6 02 16.85

On the War Department map of 1857, the City of Rock Island is laid down in latitude 41° 28′ 39″ N., and longitude 90° 39′ 13″ W.; which is 2 minutes of latitude less, and 4′ 31″ more, in longitude, than our observations give.

Note.—By applying a transcript from the Land Office Surveys, contained in C. H. Stoddard's map of Scott county, Iowa, and Rock

Island county, Illinois—published in 1857, on a scale of 1 mile to 1 inch— to our Station XVII., we obtain the approximate positions of several places in the vicinity, as follows, viz.—

NAMES OF PLACES.	North Latitude.	Longitude west from Greenwich.	
		In Arc.	In Time.
	° ′ ″	° ′ ″	*h. m. s.*
1. Rock Island City, Illinois, - -	41 28 14.3	90 35 06	6 02 20.4
2. Mouth of Rock River; the west extremity of the island in the mouth of said river, - - - -	41 29 01.3	90 35 53	6 02 23.5
3. Moline. The south end of the bridge connecting with Rock Island, - - - - - - - - - -	41 30 37	90 30 49	6 02 03.3
4. Watertown, - - - - - -	41 32 19.6	90 25 02	6 01 40.1

XVIII. FORT ARMSTRONG, ILLINOIS.

This old fort is situated on the point at the west or lowest extremity of Rock Island; an island in the Mississippi river, between the "City of Rock Island" and the City of Davenport.

By Hogane & Lambach's map of the City of Davenport, published in 1857, on a scale of 9 inches to 1 mile, or 586⅔ feet to the inch; and on C. H. Stoddard's map of the cities of Rock Island, in Illinois, and Davenport in Iowa, published in 1851, on a scale of 13.2 inches to 1 mile, or 400 feet to the inch,—scales which admit of minute measurements of courses and distances, - Fort Armstrong is laid down in reference to the centre of Washington Square, in the City of Rock Island, our astronomical station, XVII., as follows, respectively, viz.—

	Latitude North of Station XVII.	Longitude East of Station XVII.	
		In Arc.	In Time.
	″	″	*s.*
By Hogane & Lambach's map of 1857, - - - - - - - - - -	+ 20.93	— 22.87	— 1.524
By Stoddard's map of 1851, - -	+ 23.17	— 25.46	— 1.697
Mean of the two maps in reference to Station XVII. - - - - - -	″ + 22.05	″ — 24.16	*s.* — 1.61
Position of Station XVII., by our determination, - - - - - -	° ′ ″ + 41 30 37.8	° ′ ″ + 90 34 17.4	*h. m. s.* + 6 02 17.16

	North Latitude.	Longitude West of the meridian of Greenwich.	
		In Arc.	In Time.
	° ′ ″	° ′ ″	*h. m. s.*
Position of Fort Armstrong, Ills., deduced, - - - - - - - -	41 30 59.8	90 33 53.2	6 02 15.55
Davenport's House on Rock Island, - - - - - - - - - -	41 31 18.7	90 33 19.7	6 02 13.03

In Captain Andrew Talcott's report on the Ohio and Michigan boundary, made in January, 1834, he gives the position of Fort Armstrong to be in latitude 41° 31′ 09″.7 N., and longitude 90° 27′ 15″* = in time to 6*h*. 01*m*. 49*s*., exceeding us in the latitude, say 10″, and falling short of us in the longitude 26*s*.55 in time = 6*m*. 38*s*.25 in arc = 5.736 miles.

On Nicollet's map, the lower extremity of Rock Island (occupied by Fort Armstrong), is laid down 1′ 20″ in latitude less, and 8′ of longitude, = 6.91 miles more than our observations indicate. On the last War Department map (of 1857), it is laid down in latitude 35″ of latitude south, and 5′ 24″ in longitude west of the position given by our observations.

XIX. DAVENPORT, IOWA.

This beautiful city occupies the height and slope of an eminence, on the right bank of the Mississippi river, immediately opposite to the City of Rock Island, Illinois.

A mean, derived from courses and distances measured on Stoddard's map of 1851, and Hogane & Lambach's map of 1857, mentioned before, and referred to our astronomical station XVII., gives us as follows, in regard to Davenport, Iowa, viz.—

POSITIONS IN THE CITY OF DAVENPORT, IOWA.	North Latitude.	Longitude West from Greenwich.	
		In Arc.	In Time.
1. The intersection of the middle of Brady Street with the middle of Fourth Street, - - - - -	° ′ ″ 41 31 22.9	° ′ ″ 90 34 25.2	*h*. *m*. *s*. 6 02 17.7
2. Centre of the Court House, occupying the centre of the square, bounded on the north by Fifth Street, on the south by Fourth, on the east by Ripley, and on the west by Scott Street, - - - -	41 31 24.8	90 34 43	6 02 18.9

On Nicollet's map, Davenport is placed 18″ in latitude south, and 7′ 37″ in longitude west of our position, derived from the preceding observations.

On the War Department map of 1857, it is placed 16 seconds of latitude south, and 6 minutes and 5 seconds of longitude west of the position which our observations assign to it.

* Erroneously printed 90° 26′ 15″ in his report, as contained in Doc. No. 497, of the House of Representatives, 23d Congress, 1st Session. See page 6 of that document.

XX. NEW BUFFALO, MICHIGAN.

This place is situated on the south east shore of lake Michigan, nearly opposite to Chicago.

Station.—In Mr. Joshua R. C. Brown's garden. From this station to the point of intersection of the axes of Whitaker Avenue and Mechanics Street, is S. 5° 12′ W. (true) 106 feet.

1*st. The Latitude.* 1859, *May* 23*d.*

	°	′	″	
By 35 circum-meridian altitudes of α Virginis, south, combined with 32 altitudes of Polaris (α Ursæ Minoris) north; latitude of station, - -	41	47	48	N.
Reduction to the intersection of the axes of Whitaker Avenue and Mechanics Street, - -			— 1	
Latitude of the point of intersection of Whitaker Avenue and Mechanics Street, - -	41	47	47	N.

2*d. Observations for the Time.* 1*st.* 1859, *March* 16*th.*

	h.	*m.*	*s.*	
Sidereal chronometer No. 2557, fast:				
By 3 observations on α Tauri, west (at 8*h.* 42*m.*) - - -	1	25	07.46	
By 8 observations on Capella (α Aurigæ), also west (at 9*h.* 04*m.*)	1	25	07.37	
By 11 observations on 2 West Stars, giving weight according to the number of observations on each, (at 8*h.* 53*m.*) - - -	1	25	07.42	
				+ 1 25 07.42*
By 10 observations on α Bootis, east (at 9*h.* 44*m.*)				+ 1 25 09.18*
Result—Chronometer No. 2557, fast of sidereal time for this station (at 9*h.* 19*m.*) - -				+ 1 25 08.30

Clouds prevented the selection of the best time-stars; and none were visible for the latitude.

* Here it is evident that too great an index error for the sextant was used in computing the altitudes for the time by the East and West stars. That error had changed since last observed, which is the cause of the difference of results East and West;—the west observations giving too little, by an unknown quantity, and the east observations giving too much by the same quantity. The mean of the two results eliminates the error, and gives the correct time as reported. J. D. G.

3d. *The Longitude.*

This result for the New Buffalo time, and the results of the time-observations at Chicago on the nights of the 15th and 19th of March, —which last was the earliest date after our return to Chicago from New Buffalo, that observations could be made, owing to bad weather— combined with the following telegraphic signals, give us our 1st determination of the longitude of New Buffalo, viz.—

Determination of the difference of Longitude between Chicago and New Buffalo, Michigan, by electric signals for comparisons of time, March 16th 1859.

Sidereal Chronometer No. 2557, fast, of New Buffalo sidereal time (at $10h.\ 34m.\ 28s.$ sidereal time), $1h.\ 25m.\ 08s.66$.

Rate per sidereal day, $+\ 6s.793$; or per sidereal hour, $+\ 0s.283$.

Mean solar Chronometer No. 141, slow, of Chicago, mean solar time (at $10h.\ 54m.$ mean time), $4m.\ 40s.25$.

Rate per mean solar day, $-\ 0s.094$; or per mean solar hour, $-\ 0s.0039$.

1st.—Chicago signals recorded at both stations.

Times of signals given at Chicago by mean solar Chronometer No. 141.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals, as noted at New Buffalo by sidereal Chronometer No. 2557.	New Buffalo correct sidereal time of Chicago signals.	Chicago reduced sidereal time of Chicago signals.	Difference of Longitude by each signal.— New Buffalo station is east of the meridian of Chicago observing station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
10 49 20	10 54 00.25	11 59 36.5	10 34 27.84	10 30 56.30	0 03 31.54
10 52 20	10 57 00.25	12 02 37	10 37 28.33	10 33 56.79	0 03 31.54
11 13 20	11 18 00.25	12 23 40.5	10 58 31.73	10 55 00.24	0 03 31.49
11 16 20	11 21 00.25	12 26 41	10 01 32.22	10 58 00.73	0 03 31.49
1st Mean.—Electric signals sent from Chicago to New Buffalo,					0 03 31.52

2d.—New Buffalo signals recorded at both stations.

Times of signals given at New Buffalo by sidereal Chronometer No. 2557.	Times of New Buffalo signals, as noted at Chicago by mean solar Chronometer No. 141.	Chicago correct mean solar time of New Buffalo signals.	Chicago reduced sidereal time of New Buffalo signals.	New Buffalo correct sidereal time of New Buffalo signals.	Difference of Longitude by each signal.— New Buffalo station is east of the meridian of Chicago observing station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
12 05 37.5	10 55 20	11 00 00.25	10 36 57.28	10 40 28.82	0 03 31.54
12 08 38	10 58 20	11 03 00.25	10 39 57.77	10 43 29.31	0 03 31.54
12 32 42	11 22 20	11 27 00.25	11 04 01.72	11 07 33.19	0 03 31.47
12 35 42.5	11 25 20	11 30 00.25	10 07 02.21	11 10 33.68	0 03 31.47
12 38 43	11 28 20	11 33 00.25	11 10 02.70	11 13 34.16	0 03 31.46

2d Mean.—Electric signals sent from New Buffalo to Chicago,	0 03 31.516
1st Mean.—Electric signals sent from Chicago to New Buffalo, as above, - - - - - - - -	0 03 31.520
Result:—New Buffalo Observing Station is east, in longitude, of Chicago observing station No. 3, by a mean of the two sets of signals, - - - - -	— 0 03 31.518

	h.	*m.*	*s.*
Longitude of Chicago Station No. 3, -	+ 5	50	31.20

1st Determination.

Longitude of New Buffalo Station, west of the meridian of Greenwich, - - - -	5	46	59.68

On the 19th of May, I found I should be obliged to visit New Buffalo harbour again, so I determined to make it the occasion of another trial of the difference of longitude between that place and Chicago. For this purpose the observations, as recorded, were made at Chicago on the night of the 19th; and also on the night of the 21st, on my return from New Buffalo. The night of the 20th was spent at New Buffalo, where the following time-observations were made at the same station as before, viz.—

1859, *May 20th.*—Sidereal chronometer No. 2557, fast of New Buffalo sidereal time:

	h.	*m.*	*s.*	*h.*	*m.*	*s.*
By 3 observations on α Coronæ Borealis, east (at 12*h.* 51*m.*) -	1	33	13.59			
By 8 observations on ζ Hercules, also east (at 13*h.* 54*m.*) - -	1	33	13.21			
By 11 observations on 2 East Stars, giving weight according to the number on each (at 13*h.* 22*m.*)	1	33	13.31			
				+ 1	33	13.31
By 5 observations on γ' Leonis, west, (at 13*h.* 40*m.*)				+ 1	33	12.52
Result—Chronometer No. 2557, fast of New Buffalo sidereal time (at 13*h.* 29*m.*) -				+ 1	33	12.91

The night was not favourable for observation. The sky was much clouded, which again prevented a selection of the best time-stars. Those that were observed on were caught, at favourable moments, be-

tween passing clouds, and fewer observations were obtained than was desirable for a close determination of the time.

A set of observations was obtained on α Virginis, S., for the latitude; but Polaris, North, was hidden from view, and the result from meridian observations, on only one side of the zenith, being considered imperfect for a close approximation, they were not used.

The Longitude.

A second determination of the longitude of this station, is derived from the above time-observations, made at New Buffalo; combined with those at Chicago on the nights of May 19th and 21st, and the telegraphic signals, as follows, viz.—

Determination of the difference of Longitude between Chicago and New Buffalo, Michigan, by electric signals for comparisons of time, May 20th, 1859.

Sidereal Chronometer No. 2557, fast, of New Buffalo sidereal time (at $14h.\ 23m.\ 29s.$ sidereal time), $1h.\ 33m.\ 13s.17$.

Rate per sidereal day, $+\ 6s.966$; or per sidereal hour, $+\ 0s.29$.

Mean solar Chronometer No. 141, slow, of Chicago mean solar time (at $10h.\ 26m.\ 51s.$ mean time), $4m.\ 40s.65$.

Rate per mean solar day, $-\ 0s.47$; or per mean solar hour, $-\ 0s.0196$.

1st.—Chicago signals recorded at both stations.

Times of signals given at Chicago by mean solar Chronometer No. 141.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals, as noted at New Buffalo by sidereal Chronometer No. 2557.	New Buffalo correct sidereal time of Chicago signals.	Chicago reduced sidereal time of Chicago signals.	Difference of Longitude by each signal.—New Buffalo station is east of the meridian of Chicago observing station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
10 22 10	10 26 50.65	15 56 43	14 23 29.83	14 19 58.31	0 03 31.52
10 25 10	10 29 50.65	15 59 43.5	14 26 30.31	14 22 58.80	0 03 31.51
10 37 10	10 41 50.65	16 11 45.5	14 38 32. 5	14 35 00.77	0 03 31.48
10 40 10	10 44 50.65	16 14 46	14 41 32.74	14 38 01.26	0 03 31.48
10 43 10	10 47 50.65	16 17 46.5	14 44 33.23	14 41 01.75	0 03 31.48

1st Mean.—Electric signals sent from Chicago to New Buffalo, 0 03 31.494

2d.—New Buffalo signals recorded at both stations.

Times of signals given at New Buffalo by sidereal Chronometer No. 2557.	Times of New Buffalo signals, as noted at Chicago by mean solar Chronometer No. 141.	Chicago correct mean solar time of New Buffalo signals.	Chicago reduced sidereal time of New Buffalo signals.	New Buffalo correct sidereal time of New Buffalo signals.	Difference of Longitude by each signal.—New Buffalo station is east of the meridian of Chicago observing station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
16 20 47	10 46 10	10 50 50.65	14 44 02.25	14 47 33.71	0 03 31.46
16 23 47.5	10 49 10	10 53 50.65	14 47 02.74	14 50 34.20	0 03 31.46
16 26 47	10 52 09	10 56 49.65	14 50 02.73	14 53 33.68	0 03 31.45
16 29 48.5	10 55 10	10 59 50.65	14 53 03.73	14 56 35.17	0 03 31.44
16 39 49	10 58 10	11 02 50.65	14 56 04.22	14 59 35.66	0 03 31.44

2d Mean.—Electric signals sent from New Buffalo to Chicago, 0 03 31.45

1st Mean.—Electric signals sent from Chicago to New Buffalo, as above, - - - - - - - 0 03 31.49

Result:—New Buffalo Observing Station is east, in longitude, of Chicago observing station No. 3, by a mean of the two sets of signals, - - - - - - — 0 03 31.47

Longitude of Chicago Station No. 3, - + 5 50 31.20

2d Determination.

Longitude of New Buffalo Station, - + 5 46 59.73

We have here two satisfactory results for the longitude; but the unfavourable state of the sky on both nights prevented a satisfactory determination of the latitude of this station. A third visit, made on the 23d of May, gave an opportunity for a third trial of the difference of longitude between this place and Chicago, and for observing for the latitude. The night, this time, was clear, and good pairs of stars, both for the time and the latitude, were selected. Those for the latitude, and the result, are already given at the beginning of this article, XVIII.

Observations for the Time. 1859, *May* 23*d.*

Sidereal chronometer No. 2557, fast of New Buffalo sidereal time:

	h.	*m.*	*s.*
By 12 observations on α Coronæ Borealis, east (at 12*h.* 19*m.*) - - - -	+ 1	33	33.47
By 13 observations on ε Leonis, west (at 12*h.* 41*m.*)	+ 1	33	33.64
Result—Chronometer No. 2557, fast of New Buffalo sidereal time (at 12*h.* 30*m.*) - -	+ 1	33	33.55

The Longitude.

The above result for the New Buffalo time, and the observations of the 22d and 24th of May, for the Chicago time, combined with the following telegraphic signals, give us a third result for the longitude, as follows, viz.—

Determination of the Difference of Longitude between Chicago and New Buffalo, Michigan, by electric signals for comparisons of time, May 23d, 1859.

Sidereal Chronometer No. 2557, fast, of New Buffalo sidereal time (at 15*h*. 11*m*. 27*s*. sidereal time), 1*h*. 33*m*. 34*s*.71.

Rate per sidereal day, + 7*s*.351; or per sidereal hour, + 0*s*.3063.

Mean solar Chronometer No. 141, slow, of Chicago, mean solar time (at 11*h*. 02*m*. 52*s*. mean time), 4*m*. 41*s*.76.

Rate per mean solar day, + 0*s*.02764; or per mean solar hour, + 0*s*.00115.

1st.—Chicago signals recorded at both stations.

Times of signals given at Chicago by mean solar Chronometer No. 141.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals, as noted at New Buffalo by sidereal Chronometer No. 2557.	New Buffalo correct sidereal time of Chicago signals.	Chicago reduced sidereal time of Chicago signals.	Difference of Longitude by each signal.—New Buffalo station is east of the meridian of Chicago observing station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
10 58 10	11 02 51.62	16 45 01.5	15 11 26.79	15 07 54.86	0 03 31.93
11 01 10	11 05 51.62	16 48 02	15 14 27.27	15 10 55.35	0 03 31.92
11 04 10	11 08 51.62	16 51 02 5	15 17 27.76	15 13 55.85	0 03 31.91
11 22 10	11 26 41.62	17 08 55.5	15 35 20.66	15 31 48.78	0 03 31.88
11 25 00	11 29 41.62	17 11 56	15 38 21.15	15 34 49.27	0 03 31.88

1st Mean.—Electric signals sent from Chicago to New Buffalo, 0 03 31.908

2d.—New Buffalo signals recorded at both stations.

Times of signals given at New Buffalo by sidereal Chronometer No. 2557.	Times of New Buffalo signals as noted at Chicago by mean solar Chronometer No. 141.	Chicago coreect mean solar time of New Buffalo signals.	Chicago reduced sidereal time of New Buffalo signals.	New Buffalo correct sidereal time of New Buffalo signals.	Difference of Longitude by each signal.—New Buffalo station is east of the meridian of Chicago observing station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
16 54 06.5	11 07 13.5	11 11 55.12	15 16 59.85	15 20 31.74	0 03 31.89
16 57 08.5	11 10 15	11 14 56.62	15 20 01.85	15 23 33.73	0 03 31.88
17 00 09	11 13 15	11 17 56.62	15 23 02.34	15 26 34.21	0 03 31.87

2d Mean.—Electric signals sent from New Buffalo to Chicago, 0 03 31.88

1st Mean.—Electric signals sent from Chicago to New Buffalo, as above, - - - - - - - - - 0 03 31.908

Result:—New Buffalo Observing Station is east, in longitude, of Chicago observing Station No. 3, by a mean of the two sets of signals, - - - - - — 0 03 31.894

	h.	m.	s.
Brought forward,	— 0	03	31.89
Longitude of Chicago Station No. 3, -	+ 5	50	31.20

3d Determination.

Longitude of New Buffalo Station, -	+ 5	46	59.31

SUMMARY.—*Longitude of this Station:*

By determination 1st, of March 16th, 1859, -	5	46	59.68
By determination 2d, of May 20th, 1859, -	5	46	59.47
By determination 3d, of May 23d, 1859, - -	5	46	59.89

Mean, giving double weight to the last.

Longitude of New Buffalo Station, west of the meridian of Greenwich, - - -	5	46	59.78
Equal, in arc, to - - -	86°	44′	56″.7 W.
Latitude of this station, as before, - -	41°	47′	48″ N.

The above results, connected with observed azimuths of the sun, and distances determined by triangulation in our survey of this harbour, made in September, 1857, (see map G. No. 57), give the positions of other points in New Buffalo, as follows, viz.—

POSITIONS IN NEW BUFFALO, MICHIGAN.	Latitude North.	Longitude West of Greenwich.	
		In arc.	In Time.
	° ′ ″	° ′ ″	h. m. s.
1. Intersection of Whitaker Avenue and Mechanics Street (centre),	41 47 47	86 44 56.8	5 46 59.8
2. Passenger house of the Michigan Central Rail Road Station (centre), - - - - - - - - - -	41 47 47.1	86 45 01.4	5 47 00.09
3. Intersection of the middle of Merchant's Street with the middle of Brown Street, - - - -	41 47 33.1	86 45 16.8	5 47 01.12
4. The Light House, - - - -	41 47 43.5	86 45 37.4	5 47 02.49

In Colton's map of the United States, of 1851, this place is laid down in latitude 41° 51′ 30″ N., and in longitude 86° 42′ West.

XXI. NILES, MICHIGAN.

Station.—In the yard in the rear of the Methodist Church, near the N. W. corner of Fourth and Main Streets. From this station to the intersection of the middle of Main Street, with the middle of Fourth Street, is S. 22° 31′. E. 221 feet.

1*st. Observations for the Latitude.* 1859, *June 8th.*

By 14 altitudes of Polaris, north, combined with 2 altitudes of α Virginis S., observed at 16 and 21 minutes of time after meridian passage, we get:

Latitude of station (approximate), - -	41° 49′ 56″
Reduction to the point of intersection of Main and Fourth streets, - - - - -	— 2″
Latitude (approximate) of the intersection of Main and Fourth streets, - - -	41° 49′ 54″ N.

The sky to the south was so cloudy, that a satisfactory set of observations on a star passing the meridian to the south of our station, could not be obtained to combine with those on Polaris, north, for the latitude. The index error of the sextant had, however, been very carefully measured on the day of these observations, and hence we believe that the latitude, here stated, is within four or five seconds of the truth, which is quite near enough for satisfactory results in computing the time from altitudes of East and West Stars, two sets of which were obtained to-night.

2*d. Observations for the Time.*

Sidereal chronometer No. 2557, fast:

1*st Set.*

	h. *m.* *s.*		
By 12 observations on γ' Leonis, west (at 14*h.* 02*m.*) - - -	1 33 36.16		
By 11 observations on α Lyræ, east (at 15*h.* 06*m.*) - - -	1 33 36.29		
1*st Result*—Chronometer No. 2557, fast (at 14*h.* 34*m.*) - -	1 33 36.22	*h.* *m.* *s.*	
		+ 1 33 36.22	

2*d Set.*

By 11 observations on β Cygni, east (at 15*h.* 29*m.*) - - -	1 33 36.55		
By 9 observations on ε Bootis, west (at 18*h.* 06*m.*) - - -	1 33 36.92		
2*d Result*—Chronometer No. 2557, fast (at 18*h.* 06*m.*) - -	1 33 36.73		
		+ 1 33 36.73	

	h.	m.	s.
Result adopted—Chronometer No. 2557, fast of sidereal time for this station (at 15*h*. 40*m*.)	+ 1	33	36.47

This determination of the time, I consider very satisfactory. The difference between the results by the East and West Stars, is, in each set, very nearly correspondent with the known rate of the chronometer during the elapsed time; which shows that the total arc measured in each case was actually what the limb of the sextant, after applying the measured index error, reported. Hence the 14 altitudes of the star Polaris, observed for the latitude, probably gave a pretty close result, independent of a south star for eliminating errors of observation.

3*d*. *The Longitude.*

From the time-observations made at Chicago, on the 6th and 10th of June, and those of the 8th, at Niles, and the telegraphic signals of the 8th, we derive the longitude, as follows, viz.—

Determination of the difference of Longitude between Chicago and Niles, Michigan, by electric signals for comparisons of time, June 8th, 1859.

Sidereal Chronometer No. 2557, fast, of Niles sidereal time (at 16*h*. 46*m*. 37*s*. sidereal time), 1*h*. 33*m*. 36*s*.78.

Rate per sidereal day, + 6*s*.6688; or per sidereal hour, + 0*s*.2778.

Mean solar Chronometer No. 141, slow, of Chicago, mean solar time (at 11*h*. 32*m*. 56*s*. mean time), 4*m*. 45*s*.72.

Rate per mean solar day, — 0*s*.443; or per mean solar hour, — 0*s*.01845

1st.—Chicago signals recorded at both stations.

Times of signals given at Chicago, by mean solar Chronometer No. 141.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals, as noted at Niles by sidereal Chronometer No 2557.	Niles correct sidereal time of Chicago signals.	Chicago reduced sidereal time of Chicago signals.	Difference of Longitude by each signal.—Niles east of the meridian of Chicago observing station No. 3.
h. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.
11 28 10	11 32 55.72	18 20 14	16 46 37.22	16 41 08.83	0 05 28.39
11 31 10	11 35 55.72	18 23 14.5	16 49 37.71	16 44 09.32	0 05 28.39
11 34 10	11 38 55.72	18 26 15	16 52 38.20	16 47 09.83	0 05 28.37
11 46 10	11 50 55.72	18 38 17	17 04 40.14	16 59 11.79	0 05 28.35
1st Mean.—Electric signals sent from Chicago to Niles,				-	0 05 28.375

2d.—Niles signals recorded at both stations.

Times of signals given at Niles by sidereal Chronometer No. 2557.	Times of Niles signals as noted at Chicago by mean solar Chronometer No. 141.	Chicago correct mean solar time of Niles signals.	Chicago reduced sidereal time of Niles signals.	Niles correct sidereal time of Niles signals.	Difference of Longitude by each signal.—Niles east of the meridian of Chicago observing station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
18 29 15.5	11 37 10	11 41 55.72	16 50 10.31	16 55 38.68	0 05 28.37
18 32 16	11 40 10	11 44 55.72	16 53 10.80	16 58 39.17	0 05 28.37
18 35 16.5	11 43 10	11 47 55.72	16 56 11.29	17 01 39.65	0 05 28.36

2d Mean.—Electric signals sent from Niles to Chicago, - 0 05 28.367

1st Mean.—Electric signals sent from Chicago to Niles, as above, - - - - - - - 0 05 28.375

Result:—Niles Observing Station is east, in longitude, of Chicago observing Station No. 3, by a mean of the two sets of signals, - - - - - - — 0 05 28.37

Longitude of Chicago station No. 3, - - + 5 50 31.20

Longitude of Niles observing station west of the meridian of Greenwich, - - - - 5 45 02.83

Equal, in arc, to - - - 86° 15′ 42.45″

Latitude (approximate) of this station, as before given, 41° 49′ 56″ N.

By a careful survey, connected with this determination, we derive the positions of other points in Niles, as follows, viz.—

POSITIONS IN NILES.	Latitude, North.	Longitude west of Greenwich.	
		In Arc.	In Time.
	° ′ ″	° ′ ″	*h. m. s.*
1. Intersection of Main and Fourth Streets, - - - - - - - - -	41 49 54	86 15 41.3	5 45 02.75
2. Steeple of Trinity Church (Episcopal) at the S. E. corner of Broadway and Fourth Streets, -	41 49 46.1	86 15 40.1	5 45 02.67
3. Steeple of the Presbyterian Ch. on Fourth Street, between Broadway and Cherry Streets, - -	41 49 44.3	86 15 40.1	5 45 02.67
4. Foot of Main Street, on the east bank of St. Joseph river, - -	41 49 54	86 15 57.7	5 45 03.85

The 4th or last point given in the above tabulation, is the station where Captain Andrew Talcott observed in the year 1833. It was pointed out by Mr. William B. Beeson, who resided here at the time.

At page 6 of Doc. 497, House of Representatives, 23d Congress, 1st Session, Captain Talcott states its position to be:

Latitude, - - - - -	41° 50′ 09″ N.
Longitude west of the meridian of Greenwich,	86° 06′ 28″.5 W.
Or, in Time, - - - - -	5*h*. 44*m*. 25*s*.9

Our observations place this station 15″ in latitude, south, and 38 seconds of time, or 9′ 30″ of arc, in longitude, west of the position assigned to it by Captain Talcott.

Time Observations at Toledo, Ohio.

We now adopt Toledo, as our meridian of comparison, for determining the longitudes of places eastward of it.

By reference to our Station IX., it will be seen that our observing station here was determined to be in:

Latitude, - - - - -	41° 39′ 02″.26 N.
Longitude, - - - - -	5*h*. 34*m*. 09*s*.57 W.

The time-observations made at this station for comparison with those made at other stations, were as follows, viz.—

1*st*. 1859, *January* 18*th*. *At Toledo Station.*

	h. *m*. *s*.	*h*. *m*. *s*.
Sidereal chronometer No. 2557, fast:		
By 9 observations on α Andromedæ, west, (at 3*h*. 49*m*.) - -	1 06 04.99	
By 6 observations on β Andromedæ, also west (at 4*h*. 25*m*.) -	1 06 04.96	
By 15 observations on 2 West Stars, (at 4*h*. 07*m*.) - -	1 06 04.98	+ 1 06 04.98
By 10 observations on β Geminorum, east (at 4*h*. 08*m*.) - - - -		+ 1 06 05.78
Result—Chronometer No. 2557, fast of Toledo sidereal time (at 4*h*. 07*m*. 30*s*.) -		+ 1 06 05.38
By comparison—Chronometer No. 141, was slow of mean solar time for this station (at 8*h*. 16*m*. mean time) - - - - - -		— 20 50.63

2*d.* 1859, *January* 21*st.* *Same Station.*

Sidereal chronometer No. 2557, fast:

1*st Set.*

	h. *m.* *s.*	*h.* *m.* *s.*
By 13 observations on β Geminorum, east (at 4*h.* 39*m.* 30*s.*) - -	1 06 23.07	
By 2 observations on α Andromedæ, and also 10 observations on β Andromedæ, both west (at 4*h.* 08*m.*)	1 06 22.84	
1*st Result*—Chronometer fast (at 4*h.* 54*m.*) - - -	1 06 22.95	+ 1 06 22.95

2*d Set.*

By 5 observations on α Leonis, and 2 observations on β Leonis, both east, (at 7*h.* 46*m.*) - -	1 06 23.62	
By 9 observations on α Tauri, west (at 7*h.* 48*m.*) - - -	1 06 22.84	
2*d Result*—Chronometer fast (at 7*h.* 47*m.*) - - -	1 06 23.23	+ 1 06 23.23
Result adopted.—Chronometer No. 2557, fast of Toledo sidereal time, (at 6*h.* 20*m.*) by giving weight according to the number of observations in each set, - - - -		+ 1 06 23.04
By comparison—Chronometer No. 141, was slow of mean solar time for this station (at 10*h.* 16*m.* mean time) - - - - -		— 20 50.38

3*d.* 1859, *January* 24*th.* *Same Station.*

Sidereal chronometer No. 2557, fast:

	h. *m.* *s.*
By 10 observations on β Geminorum, east (at 3*h.* 40*m.*) - - - -	+ 1 06 36.14
By 10 observations on α Andromedæ, west (at 4*h.* 03*m.*) - - - -	+ 1 06 36.10

	h.	m.	s.
Result—Chronometer No. 2557, fast of Toledo sidereal time (at 3*h*. 51*m*.)	+ 1	06	36.12
By comparison—Chronometer No. 141, was slow of mean solar time for this station (at 7*h*. 36*m*. mean time)	— 20	58.04	

4*th*. 1859, *January* 26*th*. *Same Station.*

Sidereal chronometer No. 2557, fast:			
By 5 observations* on β Geminorum, east (at 3*h*. 46*m*.)	+ 1	06	44.77
By 13 observations on α Andromedæ, west (at 4*h*. 18*m*.)	+ 1	06	45.44
Result—Chronometer No 2557, fast of Toledo sidereal time (at 4*h*. 02*m*.)	+ 1	06	45.1
By comparison—Chronometer No. 141, was slow of mean solar time for this station (at 7*h*. 39*m*. mean time)	— 20	59.04	

1*st*. *Rates of the Chronometers.*

The rates of the chronometers, between the 18th and 26th of January, 1859, are given below, for use in computing the longitudes of Elyria, Cleveland, and Columbus, Ohio, with reference to the meridian of our Toledo observing station, as follows, viz.—

Rates of Sidereal Chronometer No. 2557.

1859.		Elapsed Sidereal interval.	Rate per 24 Sidereal hours.
From	To	Days and Decimals.	Gaining.
			s.
January 18,	January 21,	3.092	+ 5.710
January 21,	January 24,	2.896	+ 4.517
January 24,	January 26,	2.007	+ 4.473

* The sky became suddenly clouded in the east, and no more observations could be made in that direction, this night.

2d. Rates of Mean Solar Chronometer No. 141.

1859.		Elapsed Mean Solar interval.	Rate per 24 Mean Solar Hours.
From	To	Days and Decimals.	+ Gaining. — Losing.
			s.
January 18,	January 21,	3.083	+ 0.082
January 21,	January 24,	2.889	— 2.651
January 24,	January 26,	2.002	— 0.500

It will be observed that the rate of mean solar chronometer No. 141, changed materially, between the 21st and 24th of January, from its usual mean rate. This we attribute to the fact that it was kept, during that time, in a room very much over heated by a large iron stove. The weather during this time was very cold out of doors, and, fearing the chronometer might be subject to too cold an atmosphere, during my absence from Toledo on a visit to Cleveland, I cautioned the person in whose care it was left at Toledo, for the purpose of noting by it there the telegraphic signals of the 23d, not to permit the temperature of the room to fall below 70° of Fahrenheit. He over shot the mark, and when I returned from Cleveland on the afternoon of the 24th, on entering the room where the chronometer was, I was surprised to find the temperature so high that it was distressing to remain a moment in the room. It must be remarked, however, that this new rate, during the short period mentioned, combined with the time-observations made at Cleveland on the 23d, and the telegraphic signals which were interchanged between that place and Toledo on that night, give a result for the longitude of Cleveland, which corresponds very nearly (within 0*s*.77 of time) with that which was obtained by the interchange of signals with Chicago on the night of August 5th, 1858.

Both results were derived from observations made under very unfavourable circumstances. If they do not settle the longitude of this place definitely, it is believed that they at least give a close approximation to it, as will presently be shown, when we come to treat of that position.

XXII. ELYRIA, OHIO.

This is the seat of justice of Loraine county, and the nearest lake port is the mouth of Black river of Lake Erie.

Station.—In the court-house public square. This station is 35 feet west of the meridian, and 152 feet north of the parallel of the dome of the court-house.

1*st. The Latitude.* 1859, *January* 19*th.*

	° ′ ″
By 16 circum-meridian altitudes of β Orionis, south, combined with 16 altitudes of Polaris, north:	
Latitude of station, - - -	41 22 02.75
Reduction to the dome of the court-house, -	— 1.50
Latitude of the dome of the court-house at Elyria,	41 22 01.25 N.

2*d. Observations for the Time.* 1859, *January* 19*th.*

		h. m. s.
Sidereal chronometer No. 2557, fast:		
By 10 observations on β Geminorum, east (at 3*h.* 50*m.*) - - - -		+ 1 00 28.47
By 6 observations on α Andromedæ, west (at 4*h.* 08*m.*) - -	1 00 28.30	
By 9 observations on β Andromedæ, also west (at 4*h.* 45*m.*) - -	1 00 28.33	
By 15 observations on 2 West Stars (at 5*h.* 27*m.*) - - -	1 00 28.32	
		+ 1 00 28.32
Result—Chronometer No. 2557, fast of sidereal time for this station (at 4*h.* 08*m.*) -		+ 1 00 28.39

3*d. The Longitude.*

The above result, combined with the time-observations made at Toledo on the nights of the 18th and 21st of January, already given, and the telegraphic signals which were passed between these two places, give the longitude of Elyria, as follows, viz.—

Determination of the difference of Longitude between Toledo, Ohio, and Elyria, Ohio, by electric signals for comparisons of time, January 19*th*, 1859.

Sidereal Chronometer No. 2557, fast, of Elyria sidereal time (at 6*h.* 23*m.* 23.6*s.* sidereal time), 1*h.* 00*m.* 28*s.*93.

Rate per sidereal day, + 5*s.*710; or per sidereal hour, + 0*s.*238.

Mean Solar Chronometer No. 141, slow, of Toledo, mean solar time (at 10*h*. 21*m*. 40*s*.5 mean time), 20*m*. 50*s*.54.

Rate per mean solar day, + 0*s*.082; or per mean solar hour, + 0*s*.0034.

1st.—Toledo signals recorded at both stations.

Times of Signals given at Toledo by mean solar Chronometer No. 141.	Correct Toledo mean solar time of Toledo signals.	Times of Toledo signals as noted at Elyria, by sidereal Chronometer No. 2557.	Elyria correct sidereal time of Toledo signals.	Toledo reduced sidereal time of Toledo signals.	Difference of Longitude by each signal.—Elyria east of the meridian of Toledo.
h. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.
10 00 50	10 21 40.54	7 23 52.5	6 23 23.57	6 17 41.50	0 05 42.07
10 03 50	10 24 40.54	7 26 53	6 26 24.06	6 20 41.99	0 05 42.07
10 06 50	10 27 40.54	7 29 53.5	6 29 24.55	6 23 42.48	0 05 42.07
10 15 40	10 36 30.54	7 38 45	6 38 16.01	6 32 33.93	0 05 42.08
10 18 50	10 39 40.54	7 41 55.5	6 41 16.50	6 35 44.45	0 05 42.05
10 21 40	10 42 30.54	7 44 46	6 44 16.99	6 38 34.92	0 05 42.07
10 33 40	10 54 30.54	7 56 48	6 56 18.94	6 50 36.89	0 05 42.05
10 36 40	10 57 30.54	7 59 48.5	6 59 19.43	6 53 37.38	0 05 42.05

1st Mean.—Electric signals sent from Toledo to Elyria, - 0 05 42.06

2d.—Elyria signals recorded at both stations.

Times of signals given at Elyria by sidereal Chronometer No. 2557.	Times of Elyria signals as noted at Toledo by mean solar Chronometer No. 141.	Toledo correct mean solar time of Elyria signals.	Toledo reduced sidereal time of Elyria signals.	Elyria correct sidereal time of Elyria signals.	Difference of Longitude by each signal.—Elyria east of the meridian of Toledo.
h. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.	*h*. *m*. *s*.
8 14 45	10 51 34	11 12 24.54	7 08 33.83	7 14 15.87	0 05 42.04
8 17 45.5	10 54 34	11 15 24.54	7 11 34.32	7 17 16.36	0 05 42.04

2d Mean.—Electric signals sent from Elyria to Toledo, - 0 05 42.04

1st Mean.—Electric signals sent from Toledo to Elyria, as above - - - - - - - - 0 05 42.06

Result:—Elyria Observing Station east in longitude of Toledo observing Station, by a mean of the two sets of signals, — 0 05 42.05

Longitude of Toledo observing station,—see No. IX., *ante*— - - - - + 5 34 09.57

Result—Longitude of Elyria observing station, west of the meridian of Greenwich, - + 5 28 27.52

Equal, in arc, to - - - - 82° 06′ 52″.8 W.

Latitude of this station, as before given, - 41° 22′ 02″.75 N.

By an azimuth of Polaris, observed with the theodolite and chronometer, this night, and offsets measured next morning, from our station, we get the following positions in Elyria, viz.—

POSITIONS IN ELYRIA, OHIO.	Latitude, North.	Longitude west of Greenwich.	
		In Arc.	In Time.
	° ′ ″	° ′ ″	h. m. s.
1. Dome of Elyria Court House, -	41 22 01.25	82 06 52.3	5 28 27.49
2. Steeple of the Presbyterian Ch., built of stone, on Short Street, at the S. W. corner of Second or South Street, - - - - - -	41 22 01.21	82 06 55.1	5 28 27.67

XXIII. CLEVELAND, OHIO.

Station.—The point of intersection of the middle of Bank street, with the north-western margin of Lake street.

Comparison of Longitude with the Meridian of Chicago.
1858, *August 5th.*

The night was unfavourable for observation. The sky to the south was entirely clouded, so that no star could be observed in that direction for the latitude. The only observations that could be obtained for that purpose, were two altitudes of Polaris, north, which gave, *approximately*, as follows, viz.—

Latitude of station, - - - - 41° 30′ 10″

Observations for the Time.

	m. s.
By 11 observations on α Andromedæ, east (at 20h. 28m.) - - - - -	+ 40 08.84
By 3 observations on α Ophiuchi, and 7 observations on α Lyræ, both west (at 21h. 29m.) - -	+ 40 09.77
Result—Chronometer No. 2557, fast of sidereal time for this station (at 20h. 58m. 30s.) - -	+ 40 09.30

Clouds prevented observations on better time-stars in the west. Both ε Bootis and α Coronæ Borealis were carefully watched for, but in vain; also ζ Herculis, at a later period of the night, but he also was hidden from view.

The great discrepancy between the N. Declination of α Andromedæ, and either α Ophiuchi, or α Lyræ, combined with the fact that the latitude—which becomes a term in the equation for computing the time,—was not closely determined, induces us to doubt if our chrono-

meter error can be depended on to-night, nearer than one second of time. However, as this, even, affords a desirable approximation to the true longitude of Cleveland, we think it may be well to report the result. It depends on the time-observations for this night at Cleveland, above given, those at Chicago given under the dates of August 4th and 12th, 1858, and the following telegraphic signals, viz.—

Determination of the difference of Longitude between Chicago and Cleveland, by electric signals for comparisons of time, August 5th, 1858.

Sidereal Chronometer No. 2557, fast, of Cleveland sidereal time (at $22h.\ 18m.\ 47s.$ sidereal time), $40m.\ 09s.61$.

Rate per sidereal day, $+\ 5s.58$; or per sidereal hour, $+\ 0s.232$.

Mean solar Chronometer No. 141, slow, of Chicago mean solar time (at $12h.\ 57m.$ mean time), $4m.\ 31s.46$.

Rate per mean solar day, $+\ 0s.455$; or per mean solar hour, $+\ 0s.01896$.

1st.—Chicago signals recorded at both stations.

Times of signals given at Chicago by mean solar Chronometer No. 141.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals, as noted at Cleveland by sidereal Chronometer No. 2557.	Cleveland correct sidereal time of Chicago signals.	Chicago reduced sidereal time of Chicago signals.	Difference of Longitude by each signal.—Cleveland east of the meridian of Chicago observing station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
12 52 30	12 57 01.46	22 58 57.5	22 18 47.89	21 55 05.74	0 23 42.15
12 55 40	13 00 11.46	23 02 08	22 21 58.38	21 58 16.26	0 23 42.12
12 58 30	13 03 01.46	23 04 58.5	22 24 48.87	22 01 06.73	0 23 42.14
13 14 00	13 18 31.45	23 20 31	22 40 21.31	22 16 39.27	0 23 42.04
13 17 10	13 21 41.45	23 23 41.5	22 43 31.80	22 19 49.79	0 23 42.01
13 20 10	13 24 41.45	23 26 42	22 46 32.29	22 22 50.28	0 23 42.01
13 23 00	13 27 31.45	23 29 32.5	22 49 22.77	22 25 40.74	0 23 42.03
14 01 54	14 06 25.43	00 08 33	23 28 23.12	23 04 41.11	0 23 42.01
14 10 40	14 15 11.43	00 17 20.5	23 37 10.59	23 13 28.56	0 23 42.03
14 16 40	14 21 11.43	00 23 21.5	23 43 11.56	23 19 29.54	0 23 42.02

1st Mean.—Electric signals sent from Chicago to Cleveland, 0 23 42.056

2d.—Cleveland signals recorded at both stations.

Times of signals given at Cleveland by sidereal Chronometer No. 2557.	Times of Cleveland signals, as noted at Chicago by mean solar Chronometer No. 141.	Chicago correct mean solar time of Cleveland signals.	Chicago reduced sidereal time of Cleveland signals.	Cleveland correct sidereal time of Cleveland signals.	Difference of Longitude by each signal.—Cleveland east of the meridian of Chicago observing station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
23 59 32	13 52 54.5	13 57 25.93	22 55 40.14	23 19 22.16	0 23 42.02
0 02 32.5	13 55 54.5	14 00 25.93	22 58 40.63	23 22 22.65	0 23 42.02
0 05 32	13 58 53.5	14 03 24.93	23 01 40.12	23 25 22.13	0 23 42.01
0 20 21	14 13 40	14 18 11.43	23 16 29.05	23 40 11.07	0 23 42.02

2d Mean.—Electric signals sent from Cleveland to Chicago, 0 23 42.018

1st Mean.—Electric signals sent from Chicago to Cleveland, as above, - - - - - - - 0 23 42.056

Result:—Cleveland Observing Station is east, in longitude of Chicago observing Station No. 3, by a mean of the two sets of signals, - - - - - - — 0 23 42.037

Longitude of Chicago Station No. 3. - + 5 50 31.20

1st Approximation.

Longitude of Cleveland Station, - - + 5 26 49.16

When the time-signals were being exchanged with Chicago, there was much excitement and some interruption, from noise, in the telegraph offices at both places, arising from the celebrations which were going on in commemoration of the successful laying of the great metallic cable across the Atlantic ocean, which placed the continents of Europe and America, for a short time, in electro-telegraphic communication. The news of this important event was, this day, announced by telegraph all over our country. This accounts for the signals, forth and back, not agreeing quite so close as usual. Here there is an extreme difference of 0*s*.14 of time between the greatest and least telegraphic result. But if we except 3 out of the 14 signals transmitted, the extreme difference in the 11 remaining is only 0*s*.03 of time. So far, therefore, as the signals are concerned, there is probably no appreciable error in the mean adopted.

Comparison of the Longitude with the Meridian of Toledo.

1859, *January 22d.* Arrived at Cleveland, from Toledo, this afternoon. Cloudy all night, and no observations could be made.

January 23d. At the station which was occupied for the observations of August 5th, 1858.

Sidereal chronometer No. 2557, fast of sidereal time:

1st Set.

By 4 pairs of equal altitudes of the sun, observed A. M. and P. M., middle time of observations being apparent noon, or say (20*h*. 22*m*.) sidereal time of the 22d, - - - -		+ 59 09.33

2d Set.

By 10 observations on β Geminorum, east, (at 28*h*. 26*m*.) - -	59 10.10	
By 2 observations on β Andromedæ, west (at 28*h*. 50*m*.) - -	59 10.51	
By E. and W. Stars, (at 28*h*. 38*m*.)	59 10.30	+ 59 10.30

Result—Chronometer No. 2557, fast of sidereal time for this station, January 23d, 1859 (at 0*h*. 30*m*. sidereal), - - - - -	+ 59 09.81

Here we had, again, an unfavourable night for observation, being so cloudy that only two observations could be obtained west, for the time. The clouds were so dense to the north and south, that no observations whatever could be got for the latitude.

The time derived from the East and West stars, however, agrees well with that obtained from the equal altitudes of the sun, if we take into account the usual rate of the chronometer for the elapsed time between the two sets. This is evidence enough that our approximate latitude, used as a term in the equation for computing the time by the stars, was accurate enough for that object. The time may, therefore, be considered as pretty well determined at Cleveland on this occasion. But the disturbance in the usual rate of mean solar chronometer No. 141, owing to the very high temperature of the room in which it was kept at Toledo, during this journey, must be considered. Although we may suppose that the new rate thus acquired, was probably uniform during our absence from Toledo, yet we cannot be certain that it was so. All things, therefore, being considered, we are inclined to attribute equal weight to the resulting longitude of Cleveland, from this journey, and that which was obtained on the night of August 5th, 1858, by comparison with the meridian of Chicago.

The Longitude.

The result of the time-observations at Cleveland, of January 23d, above given, combined with that obtained for Toledo, from the obser-

vations made there on the nights of the 21st and 24th of January, and the electric signals of the 23d, give us a second *approximate determination* of the longitude of Cleveland, as follows, viz.—

Determination of the difference of Longitude between Toledo and Cleveland, Ohio, by electric signals for comparisons of time, January 23d, 1859.

Sidereal Chronometer No. 2557, fast, of Cleveland sidereal time (at 6*h*. 20*m*. sidereal time), 59*m*. 10*s*.91.

Rate per sidereal day, + 4*s*.515; or per sidereal hour, + 0*s*.188.

Mean solar Chronometer No. 141, slow, of Toledo, mean solar time (at 10*h*. 01*m*. mean time), 20*m*. 55*s*.65.

Rate per mean solar day, — 2*s*.65; or per mean solar hour, — 0*s*.1104.

1st.—Toledo signals recorded at both stations.

Times of signals given at Toledo by mean solar Chronometer No. 141.	Correct Toledo mean solar time of Toledo signals.	Times of Toledo signals, as noted at Cleveland by sidereal Chronometer No. 2557.	Cleveland correct sidereal time of Toledo signals.	Toledo reduced sidereal time of Toledo signals.	Difference of Longitude by each signal.— Cleveland, east of the meridian of Toledo observing station.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
9 40 10	10 01 05.65	7 19 20	6 20 09.09	6 12 49.45	0 07 19.64
9 43 00	10 03 55.65	7 22 10.5	6 22 59.58	6 15 39.94	0 07 19.64
9 45 50	10 06 45.66	7 25 01	6 25 50.07	6 18 30.42	0 07 19.65
10 03 40	10 24 35.69	7 42 54	6 43 43.02	6 36 23.37	0 07 19.65
10 09 40	10 30 35.70	7 48 55	6 49 44.00	6 42 24.35	0 07 19.65
10 12 40	10 33 35.71	7 51 55.5	6 52 44.49	6 45 24.85	0 07 19.64

1st Mean.—Electric signals sent from Toledo to Cleveland, 0 07 19.645

2d.—Cleveland signals recorded at both stations.

Times of signals given at Cleveland by sidereal Chronometer No. 2557.	Times of Cleveland signals as noted at Toledo by mean solar Chronometer No. 141.	Toledo correct mean solar time of Cleveland signals.	Toledo reduced sidereal time of Cleveland signals.	Cleveland correct sidereal time of Cleveland signals.	Difference of Longitude by each signal.— Cleveland east of the meridian of Toledo observing station.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m.* s.
7 31 05	9 51 53	10 12 48.67	6 24 34.40	6 31 54.06	0 07 19.66
7 34 00.5	9 54 48	10 15 43.68	6 27 29.89	6 34 49.55	0 07 19.66
7 37 01	9 57 48	10 18 43.68	6 30 30.38	6 37 50.04	0 09 19.66
7 54 56	10 15 40	10 36 35.71	6 48 25.35	6 55 44.98	0 07 19.63
7 57 54.5	10 18 38	10 39 33.72	6 51 23.84	6 58 43.47	0 07 19.63

2d Mean.—Electric signals sent from Cleveland to Toledo, 0 07 19.648

1st Mean.—Electric signals sent from Toledo to Cleveland, as above, - - - - - - - 0 07 19.645

Result:—Cleveland Station is east, in longitude, of Toledo observing station, by a mean of the two sets of signals, — 0 07 19.64

	h.	m.	s.
Brought forward	— 0	07	19.64
Longitude of Toledo Station, - -	+ 5	34	09.57

2d Approximation.

Longitude of Cleveland Station, by the observations of January, 1859, - - -	+ 5	26	49.93

1st Approximation.

Longitude of same station by the observations of August, 1858, as before given, -	+ 5	26	49.16

Approximate Result adopted—Longitude of the intersection of the middle of Bank street with the north-western margin of Lake street, Cleveland, Ohio, west of the meridian of Greenwich, -	5	26	49.54
Equal, in arc, to - - - -	81°	42′	23″.1 W.
Approximate latitude of the same station, as before given, - - - -	41°	30′	10″ N.

We think the position above given may be relied on as within 1*s.* of time for the longitude, and within 15 seconds of arc for the latitude; an approximation which may be useful to geographers.

According to this approximation, the new Court House at Cleveland is in about:

Latitude - - - -	41°	30′	05″ N.
Longitude, from Greenwich, - -	81°	42′	06″.1 W.
Equal, in time, to - - -	5*h.*	26*m.*	48.4*s.*

XXIV. COLUMBUS, THE CAPITAL OF OHIO.

Station.—From this station, to a point perpendicularly under the centre of the dome of the State Capital, is S. 10° E. (true) 277 feet, horizontal measurement. Hence, the reduction from our station to the centre of the said dome is, in latitude, — 2″.7, and in longitude — 0″.62 in arc, = — 0*s.*04 in time.

1859, *January 25th.* The night was hazy; but as any errors from the atmospheric refraction, that might arise from this circumstance, are eliminated by the system of observing on north and south stars for the latitude, and on east and west stars for the time, the results obtained to-night, both for the latitude and longitude, are considered satisfactory.

1*st. The Latitude.*

By 11 circum-meridian altitudes of β Orionis, south, combined with 15 altitudes of Polaris, north: latitude of station, - - - 39° 57′ 45″.9 N.
Reduction to the dome of the State Capital, — 2″.7

Result—Latitude of the dome of the State Capital at Columbus, Ohio, - - - 39° 57′ 43″.2 N.

2*d. Observations for the Time.*

Sidereal chronometer No. 2557, fast:

1*st Set. Before the signals.*

	h.	*m.*	*s.*
By 7 observations on β Geminorum, east (at 4*h.* 49*m.*) - -	1	04	31.96
By 8 observations on β Tauri, west (at 8*h.* 51*m.*) - - -	1	04	32.58

1*st Result. Before the signals*— Chronometer fast (at 6*h.* 50*m.*)	1	04	32.27	*h.*	*m.*	*s.*
				+ 1	04	32.27

2*d Set. After the signals.*

By 6 observations on α Tauri, west (at 8*h.* 32*m.*) - -	1	04	32.63
By 4 observations on β Leonis, east (at 9*h.* 04*m.*) - -	1	04	32.32

2*d Result. After the signals*— Chronometer fast (at 8*h.* 48*m.*)	1	04	32.47			
				+ 1	04	32.47

Result adopted—Chronometer No. 2557, fast of sidereal time for this station (at 7*h.* 49*m.* sidereal), + 1 04 32.37

The number of observations in each set would have been greater, but that the stars were frequently obscured by a mist that was passing.

3*d. The Longitude.*

The above result for the Columbus time, and the results for the Toledo time, from the observations of the 24th and 26th inst., combined with the following electric signals, give us the longitude of the State Capital at Columbus, as follows, viz.—

Determination of the difference of Longitude between Toledo and Columbus, Ohio, by electric signals for comparisons of time, January 25th, 1859.

Sidereal Chronometer No. 2557, fast, of Columbus sidereal time (at 7*h*. 09*m*. 52*s*. sidereal time), 1*h*. 04*m*. 32*s*.25.

Rate per sidereal day, + 4*s*.473; or per sidereal hour, + 0*s*.1864.

Mean Solar Chronometer No. 141, slow, of Toledo mean solar time (at 10*h*. 47*m*. 58*s*. mean time), 20*m*. 58*s*.61.

Rate per mean solar day, — 0*s*.500; or per mean solar hour, — 0*s*.0208.

1st.—Toledo signals recorded at both stations.

Times of signals given at Toledo by mean solar Chronometer No. 141.	Correct Toledo mean solar time of Toledo signals.	Times of Toledo signals as noted at Columbus by sidereal Chronometer No. 2557.	Columbus correct sidereal time of Toledo signals.	Toledo reduced sidereal time of Toledo signals.	Difference of Longitude by each signal.—Columbus east of the meridian of Toledo.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
10 27 00	10 47 58.61	8 14 24.5	7 09 52.25	7 07 43.23	0 02 09.02
10 30 00	10 50 58.61	8 17 25	7 12 52.74	7 10 43.72	0 02 09.02
10 33 00	10 53 58.61	8 20 25.5	7 15 53.23	7 13 44.21	0 02 09.02

1st Mean.—Electric signals sent from Toledo to Columbus, Ohio, 0 02 09.02

2d.—Columbus signals recorded at both stations.

Times of signals given at Columbus by sidereal Chronometer No. 2557.	Times of Columbus signals, as noted at Toledo by mean solar Chronometer No. 141.	Toledo correct mean solar time of Columbus signals.	Toledo reduced sidereal time of Columbus signals.	Columbus correct sidereal time of Columbus signals.	Difference of Longitude by each signal.—Columbus east of the meridian of Toledo.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
8 23 24	10 35 58	10 56 56.61	7 18 51.72	7 16 42·70	0 02 09.02
8 26 26.5	10 39 00	10 59 58.62	7 21 54.21	7 19 45.20	0 02 09.01
8 29 27	10 42 00	11 02 58.62	7 24 54.70	7 22 45.70	0 02 09.00
8 32 27.5	10 45 00	11 05 58.62	7 27 55.20	7 25 46.19	0 02 09.01
8 35 28	10 48 00	11 08 58.62	7 30 55.69	7 28 46.68	0 02 09.01
8 38 28.5	10 51 00	11 11 58.63	7 33 56.19	7 31 47.18	0 02 09.01

2d Mean.—Electric signals sent from Columbus to Toledo, 0 02 09.01

1st Mean.—Electric signals sent from Toledo to Columbus, as above, - - - - - - - 0 02 09.02

Result:—Columbus Observing Station, east in longitude, of Toledo observing Station, by a mean of the two sets of signals, - - - - - - — 0 02 09.015

	h.	m.	s.
Brought forward,	— 0	02	09.01
Reduction to the dome of the State Capital,		— 0	04
Dome of the State Capital is east, in longitude, of Toledo station, - - -	— 0	02	09.05
Longitude of Toledo observing station, -	+ 5	34	09.57
Result—Longitude of the dome of the State Capital at Columbus, Ohio, west of the meridian of Greenwich, - - - - -	5	32	00.52
Equal, in arc, to - - - -	83°	00′	07″.8
Latitude of this dome, as before given, -	39°	57′	43″.2 N.

Verification of the Positions of Michigan City, Indiana, and Madison, Wisconsin.

The approximate positions of these stations were given in our previous paper, printed in Vol. VI. of the Society's Proceedings; the first numbered as Station II., and the other as Station VI. See pp. 363 to 365, and 385 to 388 of that volume.

We have since had opportunities for testing the results, then reported, by more reliable observations, which we will now give.

II. MICHIGAN CITY, INDIANA.

Station.—The centre of the public square, bounded on the north by Michigan street, on the south by Fourth, on the east by Franklin, and on the west by Washington street.

By a survey made with the theodolite and chain,—the true azimuths of the courses being determined from four azimuths of Polaris, 2 by direct observation, and 2 others by reflection from the horizon of quicksilver, on the 17th May, 1859, with the times by the sidereal chronometer,—we find that this new station is S. 11° 15′ 49″ E., (true) and distant 1717 feet from our station of June 21st, 1858. Hence the reduction from the station of 1858 to that of 1859, at the centre of the aforesaid public square is, in latitude, — 16″.64, and in longitude — 4″.41 in arc, = 0*s*.294 in time.

From the centre of the public square, to the station where Captain Andrew Talcott observed in 1833, as pointed out to us by Herman Lawson, Esq., attorney at law, who was here at that time and still resides here, is N. 12° 05′ 25″ W., (true) and the measured distance

is 227 feet. Hence the reduction from our new station at the centre of the public square to Talcott's station is, in latitude, + 2″.19, and in longitude + 0″.63 in arc, = 0*s*.04 in time.

The positions of other points in relation to our observing stations, were also fixed by our survey, and will be given hererfter.

It will be remembered that the position of our station of June 21st, 1858, was stated, in our former paper, to be *approximately*, as follows, viz. (See Vol. VI. page 363.)

Latitude, - - - -	41° 43′ 25″ N.
Longitude, west of Greenwich, -	5*h*. 47*m*. 37*s*.41

This was the result of a few observations made within the space of one hour and forty minutes, on that night, and a series of telegraphic signals for comparing the longitude with the meridian of Chicago.

A reduction of the above determination, to our station of 1859, gives the position of the centre of the public square, as follows, viz.—

Determination 1st, of June 21st, 1858.

Latitude, - - - -	41° 43′ 08″.36
Longitude, west from Greenwich, -	5*h*. 47*m*. 37*s*.12

We will now give the observations made in 1859, and the results, as follows, viz.—

At the centre of the Public Square in Michigan City, Indiana.

1*st*. *The Latitude.*

	°	′	″
1859, *May* 17*th*. By 14 circum-meridian altitudes of α Virginis, south, combined with 17 altitudes of Polaris, north: latitude of station, - -	41	43	08.3
1858, *June* 21*st*. By 10 circum-meridian altitudes of β Libræ, south, combined with 5 altitudes of Polaris, north, reduced from the old, to this station, as already shown, - - - -	41	43	08.36
Result adopted—Latitude of the centre of the Michigan City Public Square, - - -	41	43	08.33

2*d*. *Observations for the Time.* 1859, *April* 28*th*.

Sidereal chronometer No. 2557, fast:	*h*.	*m*.	*s*.
By 10 observations on ε Bootis, east (at 12*h*. 11*m*.) - - -	1	31	05.20
By 10 observations on α Coronæ Borealis, also east (at 11*h*. 44*m*.) -	1	31	05.33

		h. m. s.
By 20 observations on 2 West Stars, (at 11h. 28m.) - -	1 31 05.26	
		+ 1 31 05.26
By 10 observations on β Geminorum, west (at 11h. 30m.) - - - -		+ 1 31 05.29
Result—Chronometer No. 2557, fast of sidereal time for this station (at 11h. 29m.) - -		+ 1 31 05.27

The above result for the Michigan City time, combined with the observations made on the 27th and 29th of April, for the time at Chicago, and the following telegraphic signals, give us a second determination of the longitude of Michican City, viz.—

Determination of the Difference of Longitude between Chicago and Michigan City, Indiana, by electric signals for comparisons of time, April 28th, 1859.

Sidereal Chronometer No. 2557, fast, of Michigan City sidereal time (at 12h. 47m. 47s. sidereal time), 1h. 31m. 05s.63.

Rate per sidereal day, + 6s.669; or per sidereal hour, + 0s.2775.

Mean solar Chronometer No. 141, slow, of Chicago, mean solar time (at 10h. 18m. 32s. mean time), 4m. 41s.32.

Rate per mean solar day, — 0s.17; or per mean solar hour, — 0s.007.

1st.—Chicago signals recorded at both stations.

Times of signals given at Chicago by mean solar Chronometer No. 141.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals, as noted at Michigan City by sidereal Chronometer No. 2557.	Michigan City correct sidereal time of Chicago signals.	Chicago reduced sidereal time of Chicago signals.	Difference of Longitude by each signal.—Michigan City east of the meridian of Chicago observing station No. 3.
h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.	h. m. s.
10 13 50	10 18 31.32	14 18 52.5	12 47 46.87	12 44 53.37	0 02 53.50
10 16 50	10 21 31.32	14 21 53	12 50 47.35	12 47 53.86	0 02 53.49
10 28 40	10 33 21.32	14 33 45	13 02 39.30	12 59 45.80	0 02 53.50
10 37 40	10 42 21.32	14 42 46.5	13 11 40.76	13 08 47.28	0 02 53.48

1st Mean.—Electric signals sent from Chicago to Michigan City, 0 02 53.49

2d.—Michigan City signals recorded at both stations.

Times of signals given at Michigan City by sidereal Chronometer No. 2557.	Times of Michigan City signals as noted at Chicago by mean solar Chronometer No. 141.	Chicago coreect mean solar time of Michigan City signals.	Chicago reduced sidereal time of Michigan City signals.	Michigan City correct sidereal time of Michigan City signals.	Difference of Longitude by each signal.—Michigan City east of the meridian of Chicago observing station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
14 27 44	10 22 40	10 27 21.32	12 53 44.82	12 56 38.32	0 02 53.50
14 30 44.5	10 25 40	10 30 21.32	12 56 45.31	12 59 38.81	0 02 53.50
14 36 45.5	10 31 40	10 36 21.32	13 02 46.30	13 05 39.79	0 02 53.49
14 39 46	10 34 40	10 39 21.32	13 05 46.79	13 08 40.27	0 02 53.48

2d Mean.—Electric signals sent from Michigan City to Chicago, 0 02 53.49

1st Mean.—Electric signals sent from Chicago to Michigan City, as above, - - - - - - - 0 02 53.49

Result:—Centre of public square in Michigan City, east in longitude, of Chicago observing Station No. 3, by a mean of the two sets of signals, - - - - — 0 02 53.49

Longitude of Chicago Station No. 3, - + 5 50 31.20

Determination 2d.

Longitude of the centre of Public Square at Michigan City, - - - - - 5 47 37.71

I was obliged, on the 17th of May, 1859, to go again to Michigan City, on public duty, and this visit enabled me to obtain a third result for the longitude of this place, as follows, viz.—

1859, *May*, 27*th*. *At the same Station.*

Sidereal chronometer No. 2557, fast:

	h.	*m.*	*s.*	*h.*	*m.*	*s.*
By 13 observations on β Geminorum, west (at 11*h*. 43*m*.) - -	1	33	29.30			
By 9 observations on ε Leonis, also west (at 13*h*. 01*m*.) - -	1	33	29.23			
By 22 observations on 2 West Stars, (at 12*h*. 22*m*.) - -	1	33	29.26			
				+ 1	33	29.26
By 13 observations on α Coronæ Borealis, east (at 12*h*. 02*m*.) - - - -				+ 1	33	29.30
Result—Chronometer No. 2557, fast of sidereal time for this station (at 12*h*. 12*m*.) -				+ 1	33	29.28

This result, and the results of the time-observations made at Chicago on the 16th and 19th* of May, and the following telegraphic signals, give us a third determination of the longitude of Michigan City, as follows, viz-—

Determination of the difference of Longitude between Chicago and Michigan City, by electric signals for comparisons of time, May 17th, 1859.

Sidereal Chronometer No. 2557, fast, of Michigan City sidereal time (at 14*h*. 11*m*. 12*s*. sidereal time), 1*h*. 33*m*. 29*s*.89.

Rate per sidereal day, — 7*s*.366; or per sidereal hour, — 0*s*.307.

Mean solar Chronometer No. 141, slow, of Chicago, mean solar time (at 10*h*. 27*m*. mean time), 4*m*. 41*s*.02.

Rate per mean solar day, + 0*s*.377; or per mean solar hour, + 0*s*.0157.

1st.—Chicago signals recorded at both stations.

Times of signals given at Chicago, by mean solar Chronometer No. 141.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals, as noted at Michigan City by sidereal Chronometer No. 2557.	Michigan City correct sidereal time of Chicago signals.	Chicago reduced sidereal time of Chicago signals.	Difference of Longitude by each signal.—Michigan City east of the meridian of Chicago observing station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
10 22 20	10 27 01.02	15 44 42.5	14 11 12.61	14 08 19.03	0 02 53.58
10 25 20	10 30 01.02	15 47 43	14 14 13.10	14 11 19.52	0 02 53.58
10 28 20	10 33 01.02	15 50 43.5	14 17 13.58	14 14 20.01	0 02 53.57

1st Mean.—Electric signals sent from Chicago to Michigan City, 0 02 53.577

2d.—Michigan City signals recorded at both stations.

Times of signals given at Michigan City by sidereal Chronometer No. 2557.	Times of Michigan City signals as noted at Chicago by mean solar Chronometer No. 141.	Chicago correct mean solar time of Michigan City signals.	Chicago reduced sidereal time of Michigan City signals.	Michigan City correct sidereal time of Michigan City signals.	Difference of Longitude by each signal.—Michigan City east of the meridian of Chicago observing station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
15 56 44.5	10 34 20	10 39 01.01	14 20 20.99	14 23 14.55	0 02 53.56
15 59 45	10 37 20	10 42 01.01	14 23 21.48	14 26 15.03	0 02 53.55
16 02 45.5	10 40 20	10 45 01.01	14 26 21.98	14 29 15.52	0 02 53.54

2d Mean.—Electric signals sent from Michigan City to Chicago, 0 02 53.55

1st Mean.—Electric signals sent from Chicago to Michigan City, as above, - - - - - - - - 0 02 53.577

Result:—Centre of Public Square in Michigan City is east, in longitude, of Chicago observing Station No. 3, by a mean of the two sets of signals, - - - - — 0 02 53.56

* It was cloudy at Chicago, May 18th, and no observations could be made on that night.

	h.	m.	s.
Brought forward,	— 0	02	53.56
Add longitude of Chicago station No. 3, -	+ 5	50	31.20

3d Determination.

Longitude of the centre of the public square of Michigan City, - - - - -	5	47	37.64

We have here three determinations of the longitude of this position: one from observations in June, 1858, and two from observations in 1859, namely, April 28th and May 17th. The time-stars were much better selected in 1859 than in 1858, which will appear on a comparison of their north declinations. Those in 1859, were all observed near the prime vertical, but those of 1858 were observed before reaching the prime vertical, east or west, and on different sides of it, though at nearly equal altitudes. All things considered, we think the two results of 1859 are each entitled to twice the weight of that of 1858. On this principle the final result is presented, as follows, viz.—

SUMMARY.—*Longitude of the Centre of this Public Square:*

	h.	m.	s.
By determination 1st, of June 21st, 1858, -	5	47	37.12
By determination 2d, of April 28th, 1859, -	5	47	37.71
By determination 3d, of May 17th, 1859, - -	5	47	37.64

Result adopted, giving the 2d and 3d determinations each a double weight.

Longitude of the centre of the public square at Michigan City, Indiana, west of the meridian of Greenwich, - - - - -	5	47	37.56
Equal, in arc, to - - -	86°	64′	23″.4 W.
Latitude of the same point, as before given,	41°	43′	08″.33 N.

From our survey, based on the above result, and observed azimuths of Polaris for determining the true courses, we obtain the positions of other points in Michigan City. The following table shows them all:

POSITIONS IN MICHIGAN CITY, INDIANA.	Latitude North.	Longitude West of Greenwich.	
		In Arc.	In Time.
	° ′ ″	° ′ ″	h. m. s.
1. Centre of the Public Square, -	41 43 08.33	86 54 23.4	5 47 37.56
2. Intersection of the middle of Franklin with the middle of Michigan Street, - - - - -	41 43 11.23	86 54 21.4	5 47 37.43
3. Passenger house of the Michigan Central Rail Road Company's Station, - - - - - -	41 43 18.91	86 54 26.79	5 47 37.78
4. The Light House, - - - -	41 43 22.88	86 54 32.60	5 47 38.17
5. Mouth of Trail Creek, (east cape of), - - - - - - - -	41 43 24.58	86 54 37.23	5 47 38.48
6. The Episcopal Church on Pine St. between Market and Fourth Streets, - - - - - - - - -	41 43 07	86 54 13.28	5 47 36.88

In Talcott's map, accompanying his report on the survey of the Michigan and Ohio boundary of 1833, he lays down the position of Michigan City in latitude 41° 43′ 10″.8 N., and in longitude 86° 43′ 26″.9 = 5*h*. 46*m*. 53*s*.8 W. By our observations, his station, here, appears to be in latitude 41° 43′ 10″.52 N., and in longitude 86° 54′ 24″ = 5*h*. 47*m*. 37*s*.6 W. While there is a remarkable agreement in our observations of the latitude, we place the longitude 43*s*.76 of time, = 10′ 56″.4 in arc, = 9.42 miles, west of the position assigned to it on Talcott's map.

Captain Talcott, in his report, gives the longitude of the south bend of Lake Michigan, - -	° ′ ″ 87 09 06	= h. m. s. 5 48 36.4
By applying our difference of longitude, found at Michigan City, viz:	+ 10′ 56″.4	= + 43*s*.76
We assume, for the approximate longitude of the south bend of Lake Michigan, until we can have an opportunity of connecting it by observation with our primary meridian of Chicago, - - -	° ′ ″ 87 20 02.4	= h. m. s. 5 49 20.16
The latitude of this bend, is no doubt very accurately stated by Talcott, at . - - - -		° ′ ″ 41 37 07.9 N.

VI. MADISON, THE CAPITAL OF WISCONSIN.

In our former paper, we gave an approximation to the geographical position of this place, derived from unsatisfactory observations made during unfavourable weather, which cut us off from a selection of pairs of stars well matched in declination for eliminating errors of observation, either for the determination of the latitude or the longitude.

The approximate result then arrived at appears, from more accurate observations recently made, to have given the latitude too great by about 9″.5, and the longitude too little by about 1*s*.2 of time. This, however, was far more accurate than the position assigned to Madison on any of the maps extant.

These more recent observations are now presented, as follows, viz:

1*st. The Latitude.* 1859, *June 4th. At Madison Station No.* 2.*

	° ′ ″
1. By 21 circum-meridian altitudes of α Virginis, south, combined with 17 altitudes of Polaris, north: latitude of station, - - - -	43 04 25
2. *Same night*—By 21 circum-meridian altitudes of β Libræ, south, combined with 17 other altitudes of Polaris, north, observed at a later hour of the night than the 1st set, - - -	43 04 25.24
Result adopted—Latitude of Madison station No. 2,	43 04 25.12 N.
Reduction to the dome of the State Capital,	+ 5.68
Latitude of the dome of the State Capital, -	43 04 30.8 N.

Here the stars are well paired with regard to their altitudes when observed, north and south, and the above result is, therefore, believed to be a pretty close approximation to the true latitude of this place.

2*d. Observations for the Time. Same night* (*June 4th*, 1859), *and same station.*

Sidereal chronometer No. 2557, fast:

1*st Set.*	*h.* *m.* *s.*
By 10 observations on α Canum Venaticorum, west (at 16*h*. 43*m*.)	1 45 42.17
By 10 observations on α Cygni, east (at 17*h*. 00*m*.) - -	1 45 43.15

* This station and its position relatively with that of the dome of the State Capital, will be found described in Vol. VI., at page 386 of the Society's Proceedings.

	h. m. s.	h. m. s.
1*st Result*—Chronometer fast (at 16*h.* 52*m.*) - - -	1 45 42.66	+ 1 45 42.66
2d Set.		
By 7 observations on ζ Hercules, and 11 observations on ζ Cygni, both east (at 16*h.* 04*m.*) - -	1 45 42.74	
By 9 observations on ε Bootis, west (at 17*h.* 25*m.*) - -	1 45 42.50	
2*d Result*—Chronometer fast (at 16*h.* 45*m.*) - - -	1 45 42.62	+ 1 45 42.62
Result adopted—Chronometer No. 2557, fast of sidereal time for this station (at 16*h.* 48*m.*)		+ 1 45 42.64

The above result for the Madison time, and the results of the observations for the time at Chicago on the 3d and 6th of June, 1859, already given in their proper places, combined with the following telegraphic signals, give us a new result for the longitude of Madison, as follows, viz.—

Determination of the difference of Longitude between Chicago and Madison, Wisconsin, by electric signals for comparisons of time, June 4th, 1859.

Sidereal Chronometer No. 2557, fast, of Madison sidereal time (at 15*h.* 57*m.* 45*s.* sidereal time), 1*h.* 45*m.* 42*s.*43.

Rate per sidereal day, + 6*s.*086; or per sidereal hour, + 0*s.*2535.

Mean solar Chronometer No. 141, slow, of Chicago mean solar time (at 11*h.* 12*m.* 24*s.* mean time), 4*m.* 44*s.*42.

Rate per mean solar day, — 0*s.*20; or per mean solar hour, — 0*s.*0083.

1st.—Chicago signals recorded at both stations.

Times of signals given at Chicago by mean solar Chronometer No. 141.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals, as noted at Madison by sidereal Chronometer No. 2557.	Madison correct sidereal time of Chicago signals.	Chicago reduced sidereal time of Chicago signals.	Difference of Longitude by each signal.—Madison is west of the meridian of Chicago observing station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
11 07 40	11 12 24.42	17 43 28	15 57 45.57	16 04 47.93	0 07 02.36
11 10 40	11 15 24.42	17 46 28.5	16 00 46.06	16 07 48.42	0 07 02.36
11 25 40	11 30 24.42	18 01 31	16 15 48.49	16 22 50.88	0 07 02.39
1st Mean.—Electric signals sent from Chicago to Madison,					0 07 02.37

2d.—Madison signals recorded at both stations.

Times of signals given at Madison by sidereal Chronometer No. 2557.	Times of Madison signals, as noted at Chicago by mean solar Chronometer No. 141.	Chicago correct mean solar time of Madison signals.	Chicago reduced sidereal time of Madison signals.	Madison correct sidereal time of Madison signals.	Difference of Longitude by each signal.—Madison west of the meridian of Chicago observing station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
17 52 29.5	11 16 40	11 21 24.42	16 13 49.41	16 06 47.03	0 07 02.38
17 55 30	11 19 40	11 24 24.42	16 16 49.90	16 09 47.52	0 07 02.38
17 58 30.5	11 22 40	11 27 24.42	16 19 50.39	16 12 48.01	0 07 02.38

2d Mean.—Electric signals sent from Madison to Chicago, - 0 07 02.38

1st Mean.—Electric signals sent from Chicago to Madison, as above, - - - - - - - 0 07 02.37

Result:—Madison Observing Station is west, in longitude, of Chicago observing Station No. 3, by a mean of the two sets of signals, - - - - - - + 0 07 02.375

Reduction to the dome of the State Capital, - — 0.23

Dome of the State Capital at Madison, west, in longitude, of Chicago Station No. 3, - + 0 07 02.14

Longitude of Chicago Station No. 3. - + 5 50 31.20

1st Determination.

Longitude of the dome of the State Capital at Madison, + 5 57 33.34

We also observed for the time at Madison, about midnight of June 5th, 1859, and afterwards exchanged telegraphic signals with Chicago, which gave us another comparison with the meridian of Chicago for the longitude of this station, as follows, viz.—

Observations for the Time. At Madison Station No. 2.
1859, *June 5th.*

Sidereal chronometer No. 2557, fast:

By 7 observations on α Canum Venaticorum, west (at 16*h.* 38*m.*) - - - + 1 45 46.99

By 7 observations on α Cygni, east (at 16*h.* 56*m.*) + 1 45 47.48

Result—Chronometer No. 2557, fast of sidereal time for this station (at 16*h.* 47*m.* - - - + 1 45 47.23

A comparison of this result with the last mentioned Chicago time-observations, by means of the following signals, which were exchanged

by telegraph after midnight of June 5th, give us another comparison of longitude between the two places, as follows, viz.—

Determination of the difference of Longitude between Chicago and Madison, Wisconsin, by electric signals for comparisons of time, June 5th, 1859.

Sidereal Chronometer No. 2557, fast, of Madison sidereal time (at 17*h*. 21*m*. 26*s*. sidereal time), 1*h*. 45*m*. 47*s*.37.

Rate per sidereal day, + 6*s*.086; or per sidereal hour, + 0*s*.2535.

Mean solar Chronometer No. 141, slow, of Chicago mean solar time (at 12*h*. 31*m*. 55*s*. mean time), 4*m*. 43*s*.63.

Rate per mean solar day, — 0*s*.20; or per mean solar hour, — 0*s*.0083.

1st.—Chicago signals recorded at both stations.

Times of signals given at Chicago by mean solar Chronometer No. 141.	Correct Chicago mean solar time of Chicago signals.	Times of Chicago signals, as noted at Madison by sidereal Chronometer No. 2557.	Madison correct sidereal time of Chicago signals.	Chicago reduced sidereal time of Chicago signals.	Difference of Longitude by each signal.—Madison is west of the meridian of Chicago observing station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*
12 27 10	12 31 54.64	19 07 13.5	17 21 26.13	17 28 27.76	0 07 01.63
12 30 10	12 34 54.64	19 10 14	17 24 26.61	17 31 28.25	0 07 01.64
12 45 10	12 49 54.64	19 25 16.5	17 39 29.06	17 46 30.72	0 07 01.67

1st Mean.—Electric signals sent from Chicago to Madison, 0 07 01.647

2d.—Madison signals recorded at both stations.

Times of signals given at Madison by sidereal Chronometer No. 2557.	Times of Madison signals as noted at Chicago by mean solar Chronometer No. 141.	Chicago correct mean solar time of Madison signals.	Chicago reduced sidereal time of Madison signals.	Madison correct sidereal time of Madison signals.	Difference of Longitude by each signal.—Madison is west of the meridian of Chicago observing station No. 3.
h. m. s.	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m. s.*	*h. m.* s.
19 16 15	12 36 10	12 40 54.64	17 37 29.25	17 30 27.60	0 07 01.65
19 19 15.5	12 39 10	12 43 54.64	17 40 29.74	17 33 28.08	0 07 01.66
19 22 16	12 42 10	12 46 54.64	17 43 30.23	17 36 28.57	0 07 01.66

2d Mean.—Electric signals sent from Madison to Chicago, 0 07 01.657

1st Mean.—Electric signals sent from Chicago to Madison, as above, - - - - - - - 0 07 01.647

Result:—Madison Observing Station is west, in longitude, of Chicago observing station No. 3, by a mean of the two sets of signals, - - . - - - — 0 07 01.65

	h.	m.	s.
Brought forward,	+ 0	07	01.65
Reduction to the dome of the Capital, - -		—	0.23
Dome of the Capital, west, in longitude, of Chicago Station No. 3, - - -	+ 0	07	01.42
Longitude of Chicago Station No. 3, -	+ 5	50	31.20

2d Determination of June 5th, 1859.

Longitude of this dome, - - - - -	5	57	32.62
1st Determination, June 4th, 1859, as before given,	5	57	33.34
Result adopted, giving the determination of June 4th a weight of 3, *to* 2 *assigned to that of June 5th*, 1859: longitude of the dome of the State Capital of Wisconsin, at Madison, west of the meridian of Greenwich, - - -	5	57	33.05
Equal, in arc, to - - - -	89°	23′	15″.75 W.
Latitude, as before given, - - -	43°	04′	30″.8 N.

We offer the above as a closer approximation, to supersede that heretofore reported, as derived from the less satisfactory observations of June, 1858.

J. D. GRAHAM,
Member of the Society.

Pending nomination No. 391 was read, and, the balloting being ordered, a letter from Dr. Dunglison was read, regretting his necessary absence.

The resignation of Mr. Hazlehurst was then, on motion of Dr. Hays, accepted.

No further business being before the meeting, the ballot was scrutinised, and Prof. Samuel H. Dickson, M.D., of Philadelphia, was declared duly elected a member of the Society, which was then adjourned.